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24 March 1980

CHINA REPORT
SCIENCE AND TECHNOLOGY
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NATIONAL DEVELOPMENTS

QIAN XUESEN ON SYSTEMS ENGINEERING

Beijing GUANGMING RIBAO in Chinese 10 Nov 79 p 2

[Article by Qian Xuesen [6929 1331 2773]: "Vigorously Develop Systems Engineering, Create a Systematic and Scientific Setup as Soon as Possible"]

[Text] Today there is perhaps not much disagreement concerning the importance of systems engineering. It is only necessary to point out that systems engineering is a technology which can display its function only under a suitable social system and organization of the state. The establishment of such a system and organization is a problem of productive relationship and the superstructure, and it forms the premise for systems engineering. Without this premise, even good systems engineering cannot be of service. Of course, we may suggest proposals of reform from the viewpoint of systems engineering. Furthermore, as systems engineering is very new, its meaning and limits are understood differently by different people. For example, eight different interpretations have been listed by some comrades. There is, of course, nothing wrong in having different opinions regarding a single problem. There may be exchanges and discussions to inspire one another and the understanding of the problem may be thus made more profound. By listening to the reports of comrades at this conference and reading some of the materials presented, I myself have received a great deal of education and this speech is in fact delivered for the purpose of participating in the discussion. My general idea is that when we pursue science and technology we should be guided by Marxist philosophy; therefore, when we consider a given problem, we should also start from the position and viewpoint of Marx-Leninism and the thoughts of Mao Zedong and the realities of our country. We cannot just be running behind foreigners. Whatever they cannot clarify, we should try very hard to clarify. Whatever they cannot explain we want to explain precisely. We should as much as possible, make the explanation coincide with reason. Of course, what I am going to say must not be appropriate in some areas and may also contain errors. I want to invite all of you to correct and criticize.

(1)

I feel we should first clarify the concept of "systems." In foreign countries, there are those who speak of the "systems" in systems engineering as if it is a new discovery of the 20th century and a unique creation of modern science.

We naturally cannot agree with this viewpoint because of the dialectical unity of the part to the whole and the fact that the development and evolution of internal contradiction of things and events are a common principle of dialectical materialism. This is the true essence of the concept of "systems." In the past, attention was not given to the application of the systems concept in science and technology due to the influence of the early history. In "Ludwig Feuerbach and the End of Classical German Philosophy," Friedrich Engels said: "Old methods of thinking and research which Hegel calls the methods of 'metaphysics,' study things and events mainly as something permanent and unchanging. Residues of these methods firmly occupy people's brains. These methods did have an important historic basis at that time. It is necessary to study things and events first before the process can be studied. It is necessary to know what the thing is before the kind of change occurring in that thing can be perceived. The condition of natural sciences is like that. The old metaphysics which regards things and events to be something that is already formed is produced from the natural science which studies nonbiological and biological things as something that has already been formed. When this kind of research develops to a determinant stage of a possible forward leap it will be the time for studying the changes of these things and events occurring by themselves in nature, and at that time the death knell of the old metaphysics in the realm of philosophy will also ring out." Engels calls this leap in knowledge "a great basic thought which regards the world not as a collective body of unchanging things and events, but as a collective body of processes." Is it not the collective body referred to by Engels here the same as the systems we speak of? Engels emphasizes "processes." Are they not the same developing changes of various constituent parts and their mutual actions with the whole within a system that we speak of? In fact, Engels wrote this glorious essay early in 1886, close to a hundred years ago. There are many other statements concerning the subject in the works of Marx, Engels, Lenin, and Chairman Mao. When we pursue systems engineering today, we must familiarize ourselves with these works to make them powerful weapons of theory. We must recognize the fact that the concept of systems originates from mankind's prolonged social practice and was first uplifted into a clear idea in classical works of Marxism. It definitely did not emerge suddenly in the middle of the 20th century.

"Systems" include systems that exist in nature, such as the solar system and the natural ecological system, of which no systems engineering can be spoken. Systems engineering refers to reconstruction of natural systems or creation of systems desired by men. The contribution of modern sciences and technology to systems engineering is to make this concept concrete. That is to say that systems cannot just be talked about; there should be methods to analyze a system concretely. There should be a set of mathematical theories to handle the internal relationship of a system quantitatively. But it was not until the middle of the 20th century, i.e., the 1940's, before these theoretical tools began to become complete. For this reason, the antecedents of systems engineering, i.e., operations analysis and operations research, did not appear until the 1940's. Of course, once practical results are produced by the application of systems engineering, there is a strong social force pushing for its development and it also promotes the development of

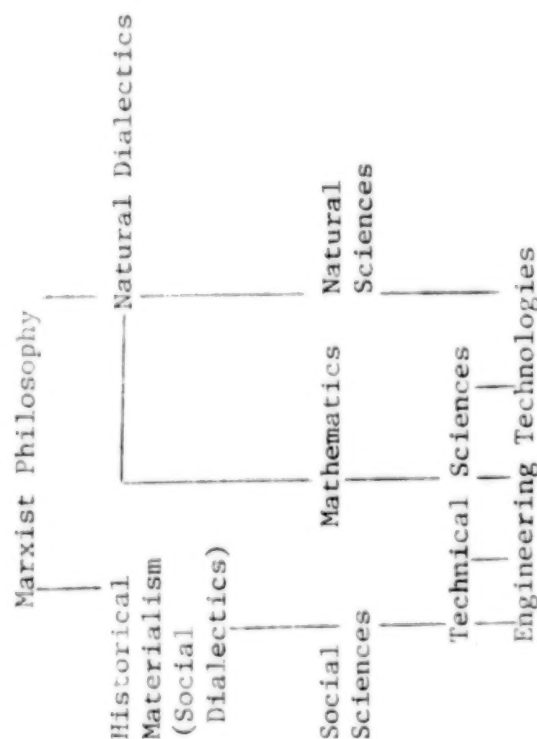
theories of systems engineering. Theory and practice promote one another. Another contribution of modern science and technology to systems engineering is the electronic computer. If the enormous computation ability of electronic computers did not exist, the practice of systems engineering would be next to impossible; the further development of many aspects of systems engineering would have to wait for the appearance of computers of even higher capabilities. This is the history of systems engineering: The concept of system, summarized from the advanced thinking of Marxism, has been growing for nearly 60 years. By the middle of this century, the necessary conditions were finally complete and a flower appeared. If giant fruit is to be harvested, further care and cultivation are required of us in the future.

(2)

Systems engineering is an engineering technology. Technologies should not be, as some people want to, called science. The special characteristic of engineering technology is its aim to reconstruct the objective world and to obtain actual results. This objective causes it to be inseparable from the concrete environment and condition. There must be certain problems to be resolved, and in order to resolve problems, the complexity of objective things and events cannot be avoided, and the fruits of many sciences must be utilized all at once. All engineering technologies are like that. For example, hydraulic engineering must utilize hydromechanics, hydrodynamics, structural mechanics, material mechanics, electrical engineering, etc., as well as knowledge of many other aspects of economics, ecology, and industrial and agricultural production. For this reason, all engineering technologies are comprehensive, and this comprehensive characteristic is not a property of systems engineering alone. Some people say that systems engineering is "highly comprehensive." This is perhaps due to the fact that systems engineering combines many fields which are commonly regarded as being unrelated. Perhaps once people are used to this condition, the word "highly" may be omitted.

Is systems engineering a field of engineering technology or a category of engineering technology which includes many engineering technologies? I tend to hold the latter opinion, because each system engineering is a special field. For example, civil engineering system engineering is a special field, military system engineering is a special field, industrial system engineering is a special field, information system engineering is a special field, economics system engineering (social engineering) is a special field. A transfer from one special field to another is, of course, not impossible, but the transfer requires a period of studying some new thing. That is to say if someone in hydraulic engineering wants to transfer to electrical engineering, he must study anew for a certain period before he can taken on the new field. As it is not a special field, the term "systems engineering" appears to be too vague. This is like saying that someone's specialty is "engineering." Others would ask "Which engineering is his specialty?" For this reason, I do not think it is necessary to add the word "specialty" to such a large category of technology like systems engineering so that misinterpretation may be avoided. It would seem like there is really a field called systems engineering. I have another reason for not adding the word "specialty" to systems engineering. I want to emphasize the aim of systems engineering in reconstructing the objective world. It is practical.

Is there a common scientific basis for the large category of engineering technologies called systems engineering? If there is, what is it? I believe in order to answer this question, we had better consider first the relationship between engineering technology and its basic theory. This is also the setup of modern sciences and technology. I believe modern sciences and technology include Marxist philosophy; natural dialectics forms the bridge linking it with natural sciences and mathematics; historical materialism (social dialectics) forms the bridge linking it with social sciences. There are natural sciences, mathematics, social sciences, followed by technical sciences and engineering technologies. The structure of this setup may be demonstrated by the following diagram:



Judging from the general setup of modern science and technology, systems engineering is an engineering technology. The question is what is the common theoretical foundation for technological sciences? The paper, "The Technology of Organizational Management--Systems Engineering" written by Xu Guozhi [6079 0948 1807] Wang Shouyun [3769 1108 0061] and myself (see WEN HUI BAO 27 Sep 78) proposed to call this common foundation operational science. In that paper, we did point out that this is an old term borrowed for this purpose. It is the same as our old translation of the foreign term, Operations Research. The old operations research included some of the content of systems engineering such as military systems engineering. This is the historical reason. Our present use of the term operational science does not

include contents of systems engineering. It includes only special mathematical theories of systems engineering, i.e., linear planning, nonlinear planning, topology, sequential theory, storage, decision, search, etc. Operational science belongs to the realm of technological sciences.

Automatic control is established on the basis of the concept of systems. In our paper in WEN HUI BAO we did not clearly make the theory of automatic control and the control theory as one of the important theoretical bases of systems engineering. This is due to a concrete reality of the present stage: There is human interference in a system. This concept may include men in the system, but the current theoretical development has not reached the stage of truly mastering all the functions and reactions of man under a given condition. If man is included in a system, an applicable theory cannot be formed. On the other hand, the present level of systems engineering generally requires human interference, including, sometimes, arousing the masses for strategic planning; therefore, it is still generally not possible to undertake a completely automated system without involving men. Due to these reasons, although we do believe that the large system or giant system of control theory and multiple stage control theory are very meaningful, it is perhaps a matter awaiting future development as far as using the control theory as a common primary theoretical foundation for systems engineering. I am saying this only in consideration of the reality. I am by no means overlooking the fact that here and abroad an important aspect of systems engineering is to include those who have been pursuing automatic control and control theory. These persons can sensitively grasp new development of the field to reach beyond the limit of their original work. They should be welcomed.

Aside from operational science, another common basis of systems engineering is computer science and computer technology.

Some comrades want to combine the two types of common theoretical bases of systems engineering with other mathematical tools and call them together "systems engineering science." I believe this is not suitable. The nomenclature does not coincide with the content: aside from the common bases, each field in systems engineering also has its special basis. As the objective is different, the regularity of the different objective should, of course, be mastered as well. For example, civil engineering systems engineering depends upon engineering design and military systems engineering depends upon military science, etc. Instead of repeating them, I will use the following table to list fields of systems engineering with their special scientific foundation:

Speciality of System Engineering	Specialized Scientific Basis of the Specialty
Civil Engineering Systems Engineering Scientific Research Systems Engineering Business Systems Engineering	Engineering Designing Science of Scientific Research Productivity Economics

Speciality of System Engineering

Information Systems Engineering
Military Systems Engineering
Economics Systems Engineering
Ecological Systems Engineering
Education Systems Engineering
Social (systems) Engineering
Metrological Systems Engineering
Standards Systems Engineering
Agriclutural Systems Engineering
Administration Systems Engineering
Legal Systems Engineering

Specialized Scientific Basis of the Specialty

Information Theory, Intelligence
Military Science
Political Economics
Ecological Science
Educational Science
Sociology, Futurology
Metrology
Science of Standardization
Agriclutural Science
[Government] Administration
Law

The above table demonstrates that the various fields of systems engineering cross over natural sciences, mathematics, social sciences, technical sciences, and engineering technologies; therefore, in order to develop systems engineering overall cooperation and joint efforts are required from scientists and technologists of all different fields. This conference of ours does have the participation of social scientists. Although their number is small, their participation has great significance. I feel Comrade Liu Yuanzhang [0491 3293 1728] put it very well in his speech before this conference: He pointed out that the problem of management of factories and industries involves human beings while human beings are social beings, influenced by the society in which they live. Due to the fact that the Chinese society is different from foreign societies, we must never overlook this difference in our practices of systems engineering.

(3)

The above table lists 14 fields of systems engineering. As a matter of fact, the table remains incomplete. There are and will be other specialties of systems engineering because in highly organized modern society, complex systems exist almost everywhere. Any social activity can form a system, while the organizational establishment and effective operation of that system will form a field of systems engineering. When there are a large number of systems in a single category, this field of systems engineering becomes a specialty. We can, therefore, add many other systems engineering specialties to that table.

Half, or seven, of the systems engineering specialties in that table are familiar to all and they need no explanation. The first of the other half is educational systems engineering. This specialty concerns schools. The establishment, management, and operation of a local school and a state's educational system have a special scientific basis, to form the science of education, which is a social science. I believe the problem of macro economic planning spoken of by Comrade Xue Baoding [5641 1405 7844] before this conference is social systems engineering, which may also be simply called social engineering. It is for organizing and managing the construction of socialism. That is to say after the central government has decided a policy of an historical stage

(for example, the need for the realization of the Four Modernizations in today's China) it is for the social engineering to devise a general construction, and to formulate plans and regulations. The theoretical sciences required are the two social sciences of sociology and futurology. Metrological systems engineering and standards systems engineering are for undertaking regional or state metrological and standards systems and their organization, establishment, and normal execution have become very important functions of a modern society. Their importance in agriculture, forestry, animal husbandry, auxiliary industry, and fishery is beyond doubt. To regard modern agriculture as a form of systems engineering is the suggestion of Comrade Zhang Qinwen [7128 3084 2429]. I believe this is a very good suggestion, and should receive support. The special theory of agricultural systems engineering is called "agricultural science" by Zhang Qinwen. These ideas were mentioned by Comrade Ma Shijun [7456 0013 7486] and Comrade Li Dianmu [2621 0368 6206] in this conference as well. Administration systems engineering is for complete scientification of the work of government administration and agency management under the system of socialism. The technology of modern document search can also be computerized, of course. A computer can draft documents or criticize documentary drafts, and it may perhaps propose several possible drafts for the selection of the leaders. The multiple-target decision making spoken of by Comrade Gu Jifa [7357 1015 4099] is definitely useful. The theory of administration systems engineering is perhaps government administration. The rule of law in socialism requires a series of laws, articles, and precedents, from the state's constitution to regulations of departments, to form a setup of laws, which is a strict scientific setup and is also systems engineering, a legal systems engineering. Its special basic science is the law. In view of the urgent problem of China's realization of the Four Modernizations, the last three fields of systems engineering concern the development of agriculture, improvement of administrative efficiency, and strengthening the rule of law of socialism. Their importance should be very obvious. Of course, the present concept of systems engineering has been made concrete for a little more than 10 years only. The first few specialties of systems engineering in the table may be regarded as already established. They may be said to have relatively stable work methods and instructive materials to teach students. Generally speaking, starting with ecological systems engineering, the eight specialties following are either being formed or remaining ideas. Their realization depends upon our future efforts. With courage, we have listed them in the table and declare that there are many others not listed but will appear in the future as systems engineering specialties. Are we somewhat careless? I believe in view of the establishment of the concept of systems as early as a century ago by Marx and Engels, the rapid development of operational science and electronic computer technology, our suggestion is not at all excessive. For the purpose of the four modernizations, we must develop each and all specialties of systems engineering with all our efforts.

It was on the basis of this understanding that we proposed last year to establish schools of higher education specializing in organizational management in a combination of "theory" and "engineering." We also proposed that in the future China will not be establishing several such colleges of organizational management but several tens of such colleges, and several

hundreds of such colleges of various types of organizational management specialties. For example, today there are comprehensive science and engineering colleges as well as special aviation colleges, ship-engineering colleges, communication engineering colleges, etc. Corresponding middle level special schools should also be established. This will be an important new reform in education. Judging from this conference, this reform has already begun. Education in systems engineering has already become the concern and emphasis of the Ministry of Education. Shanghai College of Machines has added a department of systems engineering. Research institutes or research laboratories in systems engineering have been established in Xi'an Jiaotong University, Qinghua University, Tianjin University, Central China College of Engineering, Dalian College of Engineering, and Shanghai College of Chemical Engineering. Among the military schools, the National Defense Science and Technology University has established a department of systems engineering and mathematics and other military colleges have also started to develop systems engineering work. With this beginning, we believe in a few years the first combined scientific and technological organizational management college will be ready to be established in China. I suggest that this matter should be included in the state's 6th Five-year Plan.

The development of systems engineering requires improved scientific exchanges among those engaging in the project to promote scientific discussions. This conference may be considered as the first such successful activity. At present, several research societies and associations have given systems engineering a great deal of attention. For example, the Aviation Society sponsored a class to discuss systems engineering and operational science; the Society of Automation has a systems engineering committee; the Committee of Mining Science of the China Society of Metals established a systems engineering specialty group; the Management Modernization Research Association also organized a systems engineering discussion meeting. It may be said that scientific activities have begun. All of us may give the idea of whether or not to establish a specialty of systems engineering some consideration.

(4)

The above discussion demonstrates that the problems that may be resolved by systems engineering involve reconstructing nature, reconstructing and improving social productivity, reconstructing to improve national defense capabilities, reconstructing various social activities, as well as reconstructing our country's administration and laws. In a word, systems engineering involves the entire society. The social changes ahead of us that are induced by systems engineering will definitely not be less important than the change occurred some 120 years ago. The development and growth of natural sciences produced scientific engineering technology. The skills of mankind that had been accumulating for hundreds and thousands of years in reconstructing nature were raised to the level of theoretical sciences, and from these emerged the great changes. Systems engineering is a great new creation, and the appearance of the entire society will have a great change.

Of course, today we are merely in the beginning of that process. Just as we mentioned before, we can perceive today only a very small portion of it. Even the 14 fields of systems engineering listed in the above table comprise only

a portion of all the systems engineering fields. For the same reason, what we have just said cannot be definitely and precisely correct, while in future practice, the 14 fields of systems engineering we have just classified may also require adjustment later. More importantly, when systems engineering is practiced in a scale involving the entire society, it will propose many theoretical problems which cannot even be imagined at present. The theory of systems engineering will have gigantic development, which will include the following two aspects: On the one hand, as it is manifested in the table the scientific fields that have special relationship with each field of systems engineering are either natural sciences or a technological science branching out of natural sciences. In the future, there will include more social sciences or technological sciences branching out of social sciences; there will be a large quantity of new scientific fields. On the other hand there will be a broader development in operational science which is the methodological theory of systems engineering, because practice will present higher demands from theory. Just as we have mentioned before, in the future, systems engineering will make more use of control theory, not only engineering control theory but also social control theory. We must also create some mathematical methods for the special use of systems engineering, especially with respect to mathematical computation of variables, such as statistics, probability, etc. Computational mathematics will also develop in certain specific aspects due to the practice of systems engineering.

It may be said that the scientific development brought about by systems engineering involves a very extensive frontier. It involves not one or several sciences but several tens of sciences. Japanese scientists proposed a new term, "soft science." Our Japanese friends did not give an explanation, but I think the word "soft" perhaps originates from "software." Due to the fact that the object of these fields is mainly treatment of information, they handle "soft" matters, unlike the natural sciences we have been familiar with in the past. These always deal with the velocity, the force, and the energy of matter in motion; therefore, they handle "hard" things. The series of scientific fields we mentioned above may, therefore, be generally included in that borrowed term "soft sciences." Let me provide a further consideration, however. From the practice of systems engineering in reconstructing the objective world, a series of theoretical sciences on the level of technological sciences have been extracted. Can this be the end? Should there be further generalization to raise them to the level of basic sciences? For example, will operational science bring about operations theory, and control theory (including engineering control theory, biological control theory, social control theory, and artificial intelligence) bring about theoretical control theory? The possibility is there. The report of Comrade Xu Guozhi [6079 0948 1807] before this conference clearly points out: Through precise mathematical treatment, different things and events in different processes may be discovered to have theoretical similarity. It cannot be said that this similarity may not bring about new concepts of more profound and general but hidden significance. Is it not the way the concept of energy in physics is produced? The current theoretical research on hadron theory is no more than a new concept derived from the idea that a "vacuum" is not empty proposed by quantum chromodynamics. We must, therefore, acknowledge the possibility of appearance of

theoretical operations theory and theoretical control theory. In this manner, the term "soft science" may seem to be rather limited and not sufficiently profound. Moreover, we must observe the fact that there are many "hardwares" in systems engineering, unlike "software engineering" which specializes in dealing with software. The term "soft science" is, therefore, not suitable. We should return to the basic concept of systems and adopt the term "systems science." Systems science parallel natural science and social science; it is a basic science.

After the concept of systems science is established, we will have a scientific setup to create the possibility of considering problems from the point of view of the structure of a complete scientific setup, i.e., to study the development of systems science with the above table as a reference. Starting with such basic science as the systems science for studying systems and combining with other basic sciences, we shall compose a series of technological sciences for studying common systems problems. Perhaps, these fields of study may all be called systems studies. At present, systems studies are primarily operational science. There are other technological sciences and social sciences that have special relationship with various fields of systems engineering, and hence related to systems science. The field that undertakes to reconstruct the objective world directly encompasses all the fields of systems engineering.

This is also to say that the scientific and technological setup in the above table describes only the current situation; it does not include the development we just talked about. In the 21st century, basic sciences cannot be merely the three categories of natural sciences, social sciences, and mathematics; the category of systems science should also be added. As a matter of fact, several decades from now, there will definitely be other changes. For example, before this conference, Comrade Wu Wenjun [0702 249 0193] proposed mechanization of mathematics. This is a very exciting new reform. Of course, after new discoveries and new developments have made the philosophy of Marxism more substantial, more developed, and more profound, it will remain the basic theory that guides all sciences and technology.

The epistemology of dialectical materialism teaches us that the objective world exists independent of the will of man. Men can recognize the objective world step by step through social practice, but after men have mastered the regularities of movement of the objective world, men can also actively utilize these regularities to reconstruct the objective world, and in the process of practice, men monitor the correctness of their knowledge. I am here to propose development of systems engineering with great efforts and establishing viewpoints of a system science setup. Does my viewpoint coincide with the epistemology of Marxism? Should this proposal be carried out? Does it mean a realization of the great thoughts of Engels of a century ago? All these are problems worthy of consideration. The discussions before this conference inspired us a great deal, but after the conference we must continue to study so as to steady the direction of future development. Let us all work hard for this.

NATIONAL DEVELOPMENT

CHENGDU BRANCH, CAS, FOCUSES ON TECHNOLOGICAL SYSTEMS WORK

Beijing GUANGMING RIBAO in Chinese 10 Nov 79 p 2

[Article: "Chinese Academy of Sciences Chengdu Branch Strengthens Technological Systems Work To Serve Scientific Research"]

[Text] Chinese Academy of Sciences Chengdu Branch concretely strengthens the technological systems work of its various institutes. In a little more than a year, they have raised the understanding of all concerned with respect to the importance of technological systems. Attention has been given to inspire those engaging in technological systems to be positive in their work. On the other hand, arrangement has been made to organize concrete work well. In those research institutes that have central laboratories, manpower has been further expanded and leadership strengthened. In those that have no central laboratories, important general instruments and equipment have been gathered together to establish a central laboratory. The institutes have also gathered their manpower, intermediate experimental equipment and instruments, and installation and repair personnel to form technical preparation rooms (or machine shops.) Through serious discussions, the direction of responsibility of technological systems has been clarified to be as follows: To provide, actively and positively, means of experimental techniques for scientific research; to proceed seriously with intermediate experimentation; to transform fruits of scientific research into creating conditions for producing products, to carry out coordination within the academy, to open up resources and to conserve expenses, to increase production, and to create more wealth for the state.

In the next 3 years, the emphasis of technological systems work of Chengdu Branch will include the following: (1) Without changing the organizational structure, the management accounting will remain independent. Under the principle of unified organizational leadership and shouldering common responsibilities together, the institutes and factories will unite for positive service to scientific research. (2) The institutes will adopt the system of contract between teacher and apprentice to use the method of having the old-brining-up-the-new system of training technical teams. Based upon the work load, short-term training classes of indefinite duration, technical lectures, technical demonstrations, etc. may be organized for technological learning and exchange. (3) With service to scientific research as the center, resources

should be opened up and expenses conserved to find ways of producing wealth. The central laboratory of the various institutes should enlarge the areas of service and positively accept jobs of analysis and testing from outside the institute in order to increase income. At the same time, combined with the work of extending the application of fruits of scientific research, small quantity production of some items should be organized.

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NATIONAL DEVELOPMENTS

RESEARCH-PRODUCTION AGREEMENTS SIGNED

Beijing GUANGMING RIBAO in Chinese 14 Jan 80 p 1

[Article: "Turn the Results of Scientific Research Into Productive Power as Soon as Possible"]

[Text] The Institute of Physics of the Chinese Academy of Sciences recently signed agreements with several factories calling for turning the former's achievements into productive power and putting some of its designs into commercial production with part of their profits going to benefit the researchers.

The institute has decided to let one of its research results--"magnetic recording materials"--go into commercial production, according to a contract it recently signed with the Guangzhou Dyestuffs and Chemical Plant. Under this contract, the former shall provide the latter with technical information on producing this item, and with assistance in setting up a magnetic testing center and in training a technical force in this field in exchange for the right to use the latter's laboratory testing equipment. The plant also voluntarily proposed to let the institute share some of the profits from the successful marketing of this product.

The magnetic recording materials are indispensable raw materials for developing electronic technology, and for producing magnetic belts, magnetic discs and magnetic cards. The magnetic powder, another of the institute's achievements in research, has proven highly effective and capable of meeting the international standards through a test of its quality at the Guangzhou Dyestuffs and Chemical Plant. The plant has received an order from a foreign firm for this product and is expected to produce 200 tons of it a year, according to its initial estimates.

Trial-production of the "ionization thinning device"--another achievement in research by the Institute of Physics--is now underway at the Liaoyuan No 4 Radio Plant, Jilin Province, according to an agreement they have signed. The "ionization thinning device" is an instrument for observing and analyzing samples of products capable of eroding and thinning such hard and solidified materials as diamond, meteorite, fluoric plastics, and teeth. In order to

insure the quality of the product, both sides have agreed that the institute shall aid the plant in solving key technical problems in production, and shall provide it with a perfect prototype model of this device along with its blueprint and related information, while the plant shall provide key and auxiliary equipment for producing samples of the device. After it is put into commercial production, the plant shall agree to let the institute receive 30 percent of its profits from the marketing of this product for 3 years.

The Institute of Physics pointed out: efforts must be made to turn the results of scientific research into productive power and make it play a role in the Four Modernizations. Before they can be widely applied in production, it seems advisable to sign some agreements and establish relations of cooperation with some plant which is well-equipped and willing to put some of its selected designs or achievements in research into commercial production. But this form of cooperation must take into consideration the special nature of every specific scientific research unit. For example, the scientific research projects must be carried out under an overall arrangement in response to the needs of the state rather than in consideration of the profit sharing as the main point of cooperation; scientific researchers should return to their original units after fulfilling their contract obligations to a plant. Income from this form of cooperation will be mainly used to benefit the research and to reward those researchers who deserve it. The institute concluded that during this trial period of cooperation between the institute and the plants, more experiences are needed to improve and perfect this system of joint venture.

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CSO: 4008

PHYSICAL SCIENCES

MAIN FEATURES OF RUNOFF IN TIAN SHAN MOUNTAINS ANALYZED

Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese Vol 34 No 2,
Jun 79 pp 118-128

[Article by Tang Qicheng [3282 1142 2052] of the Geography Institute of the Chinese Academy of Sciences]

[Text] Arid regions (including semi-arid regions) comprise one-third of the world's total land surface. In our country, arid regions comprise roughly one-fourth of the country's total area. In keeping with the development of agriculture and industry in our country, there is an increasingly pressing need for water in arid regions. Therefore, analytic research on the drainage characteristics of arid regions bears significant meaning to the water needs for industry, agriculture, animal husbandry, and domestic activities.

Among our country's vast arid regions, the towering Tian Shan Range lying across the middle of Xinjiang Province in the country's northwestern frontier is like a humid island in a sea of desert. In terms of sources of water supply, the Tian Shan range is the most humid mountain range among arid regions of the world.

There is as yet no figure on the area of the Tian Shan region within our borders. According to our present survey, the total area of the Tian Shan Mountains is 244,000 square kilometers. The latter includes some low-lying ranges, such as the Huoyan Shan Range, the Queneta, and the northern slopes of the Tian Shan range. Although these low-lying ranges are part of the Tian Shan system, they are not a source area of runoff. It is estimated that the source area of runoff in the Tian Shan system within our borders is approximately 187,000 square kilometers. From this source area originate many rivers and streams, among which is the longest inland river in our country, the Ili River. On the northern slopes of the Tian Shan Mountains are the Irtysh River, the Manas River, the Jing River; on the southern slopes are the Kaidu River, the Weigan River, and the Aksu River, etc. The world's well-known inland river, the Tarim River, is a continuation of the Aksu River in terms of its drainage composition.

1. Perennial Streams and Their Sources

Based on substantiated information available before 1974, the total annual overland flow of the Tian Shan drainage basin was 56,300 million cubic meters. The latter constitutes about 59 percent of the total annual overland flow in Xinjiang Province. The average channel depth was 231 millimeters. The Yellow River drainage basin is 3.1 times that of Tian Shan, but the former's total annual overland flow is similar to the latter. The channel depth of perennial streams in the Tian Shan Mountain region is also close to the national average. In terms of total overland flow in the Tian Shan Mountain region, the northern slopes contribute over 30 billion cubic meters, whereas the southern slopes contribute approximately 25 billion cubic meters. In summary, the Tian Shan Mountain region is a treasure house in Xinjiang Province. The rivers and streams which originate from the region not only supply water to industry, agriculture, animal husbandry, and domestic needs on both the northern and southern slopes of the mountain range, they also provide the main source of underground water in the adjacent lowlands. Figure 1 shows the annual water discharge of the various major rivers and streams in the Tian Shan Mountain region.

In addition to runoff, there are many glaciers and much permanent snow cover in the Tian Shan Mountain region. The latter has a total of 6,896 glaciers, comprising an area of 9,548 square kilometers. Most of them are concentrated in the western section such as the Hantengri Mountain and the Haleiketu Mountain. In this area, mountain complexes rise to around 7,000 meters above sea level. The area of glaciers measures 5,045 square kilometers--a giant "frozen reservoir" in the Tian Shan Mountain region.

The geographical distribution of runoff in the region is very uneven. The overall pattern coincides with the pattern of rainfall distribution, that is, the northern slopes have more runoff than the southern slopes, and the western section has more runoff than the eastern section (Figure 1). Furthermore, the proportion between stream length and stream depth is significantly regular--the depth of a perennial stream increases in proportion to the elevation of its drainage area. The distribution of perennial streams in the Tian Shan Mountain region is shown in Figure 2.

We can see from Figure 2 that:

1. The length of runoff decreases from west to east, roughly from 500 millimeters to less than 100 millimeters. This is because humid air masses tend to come from the west and the north.
2. Within the Tian Shan Mountain region, the annual total runoff volume in intermontane basins and valleys is lower than that in adjacent mountains, for example, the Zhaosu basin, the Yanqi basin, the Ili River valley, and the Tuoshigan River valley, etc. Owing to the extensive swamps, the various large and small Yourdous basins in the upper course of the Kaidu River generate a very limited source of water--an average of 100 to 200 millimeters.

3. There is a very significant regularity in the vertical zonation of runoff. In general, the depth of a perennial stream increases in proportion to the elevation of the drainage basin. Hence, there is a fairly close correlation between stream depth and drainage elevation. However, this correlation depends strongly on locality. There are many differences between the northern and southern slopes in this respect, and also between the eastern and the western sections. For instance, Figure 3 shows the difference between the correlation of long-term average stream depth and basin elevation of rivers between the Jing River and the Manas River on the northern slopes, and the same relationship measured in 1962 of the correlation of stream depth and basin elevation of rivers between the Aksu River and the Yanqi River on the southern slopes.

As shown in Figures 1 and 2, the runoff coefficients in the Tien Shan Mountain region vary between 0.7 to 0.1. The runoff coefficients are higher in snow-clad, high-altitude areas, and lower in intermontane basins and valleys. Similar to the distribution of rainfall and streams, the distribution of runoff coefficients shows a fairly well formed vertical zonation (Figure 4).

Unlike the eastern regions of our country, the sources of runoff in the Tian Shan Mountain region are many and diverse. There is water supply from glacial meltwater, meltwater from seasonal snow cover, rainfall, and underground water. The characteristic features of water sources in the Tian Shan region are:

1. Significant regularity in their vertical zonation. On the average, meltwater from snow cover is the main water source in high-altitude areas, whereas rainwater and meltwater are common sources in middle-altitude areas. Of course, the elevation at which meltwater forms the chief source of water varies. For example, the lower limit of such an elevation varies from 3,200 to 3,800 meters.

2. Underground water supplies roughly 30 percent of runoff volume at the foothills. However, there are zones of impermeable rock materials on both the northern and southern slopes of the Tian Shan Range, such as the zone between Kuytun and the Manas on the northern slopes, and the Baicheng Basin on the southern slopes. Since the rock materials of these geographic zones are impermeable, the supply of underground water to perennial streams at these locations can reach over 40 percent. For instance, underground water contributes about 45 percent of the total annual runoff volume of the Manas River at the Hongshanzui station.

3. With regard to the proportion of glacial meltwater in runoff, measurements vary greatly even on the same river, depending on different methods of measurement at the present time. Nevertheless, based on available information, it is still possible to estimate the proportion of glacial meltwater for some rivers (Table 2).

The figures in Table 2 are averages. The proportion of annual meltwater varies greatly from year to year depending on temperature and rainfall conditions.

Although the various streams in the Tian Shan Mountain region are fed by glacial meltwater, the amount of such water in each stream varies with location. In the western section, the highest peak in the Tian Shan Range, the Tuomur Mountain, and peaks rising above 7,000 meters accommodate extensive tracts of glaciers, whose meltwater is the origin of the numerous streams. The southern slopes are relatively dry, so that glacial meltwater contributes slightly over half of runoff volume. On the other hand, rainfall on the northern slopes reduces the proportion of meltwater in runoff volume to around 40 percent. The Yilianhabiduo Mountain area in the central section has large tracts of glaciated areas, and meltwater contributes about 45 percent of annual runoff volume. Higher rainfall in the Urumqi area reduces the proportion of meltwater to 10 to 20 percent. The proportion of meltwater is less than 30 percent in places in the east such as Fukang and Qitai. But in the Haleketu Mountain area in the east, where glaciers are less numerous but rainfall is also scanty, meltwater contributes roughly 50 percent of annual runoff volume, especially in smaller streams on the southern slopes.

The drainage characteristics in the Tian Shan Mountain region are affected in various ways by the large volume of glacial meltwater.

(1) The fluctuation of runoff volume in streams fed by meltwater is smaller than that in streams fed by rainfall.

(2) Snow cover on high elevations is subject to melting during the summer. The melting season coincides with the season of summer rainfall. Hence, the character of runoff fluctuation is: summer water flow accounts for the lion's share of annual flow, and floods are most common in the summer.

(3) Meltwater lowers water temperatures. In the upper course of some rivers, variations in the daily runoff volume are significant. Compared to streams fed by rainfall, there is less suspended load in runoff fed by meltwater.

4. The supply of seasonal meltwater is limited only to some runoff on the northern slopes of the Tian Shan Mountain region. For some rivers, such as the Ili River, meltwater and spring rains coincide, leading to spring floods. Spring floods which are fed merely by seasonal meltwater are not common, for in general such meltwater contributes less than 10 percent of the annual runoff volume.

II. Annual and Seasonal Fluctuations of Runoff

The variation coefficients of perennial streams in the Tian Shan Mountain region (in C_v values) vary between 0.1 to 0.2. Only a few rivers in the eastern section register values reaching 0.3. This is one of the areas of our country where runoff fluctuations are at their lowest. This is a drainage characteristic favorable to water utilization in agriculture and animal husbandry. Compared to East China, there are no serious droughts or floods, and agricultural production is relatively stable.

Based on available information, the range between the absolute maximum annual runoff volume and the absolute minimum of the major rivers vary from 1.4 to 2.0. In the case of the Manas River, the range is 1.50; 1.63 in the Kaidu River, 1.44 in the Weigan River, and 1.70 in the Ili River. This is mainly due to the volume of glacial meltwater vis-a-vis temperature conditions, and the latter fluctuate even less than rainfall. Owing to greater rainwater component in its middle course, the value of the Ili River is greater. As the eastern section of the Tian Shan Mountain region is located at the leeward side of rain-bearing air masses, and that it is also remote from the influence of the southwest summer monsoon, the value rises to 3.0. For instance, the value of the Kaiken River is 3.0, and the value of the Toudagou is 3.4.

The seasonal fluctuation in runoff volume in the Tian Shan Mountain region is great, depending mainly on conditions such as:

1. Concentration of water flow in summer, comprising an average of 50 to 70 percent. This is advantageous to irrigation agriculture, which practically characterizes Xinjiang Province.
2. The annual distribution varies between the northern and the southern slopes. In general, rivers on the northern slopes receive their supply from both seasonal meltwater and rainfall, leading to short-term spring floods. Spring floods are generally rare on the southern slopes.
3. Another characteristic about seasonal runoff fluctuation is greater autumnal discharge versus spring discharge. The difference is negligible only in the Ili River, which receives more rainfall during the spring. Owing to the regulating effects of the Yourdous basin in its upper course, the Kaidu River shows lesser seasonal fluctuations. Even then, spring discharge is still smaller than autumnal discharge. The seasonal runoff fluctuations of the major rivers in the Tian Shan Mountain region can be seen in Table 3.

Not only are year to year runoff fluctuations limited among the rivers of the Tian Shan Mountain region, season to season runoff volume fluctuations are also relatively slight. Estimates show that the seasonal C_v value is generally less than 0.5; whereas in semi-arid regions such as the Daning station on the Xinshui, a tributary of the Yellow River, the season to season fluctuation is greater than 0.5, the highest C_v value being 0.86. Within the four seasons, underground water contributes the main source of water during the winter. Its discharge is steady, and the C_v value is at its lowest. The C_v value is also low during the summer owing to plenty of meltwater coming from high elevations. Such a C_v value is close to the annual C_v value. The C_v value is greatest during the spring, but they are lower in rivers subject to spring floods owing to meltwater. The differences in C_v values between seasonal fluctuation and annual fluctuation is great and it varies greatly from river to river. For instance, the seasonal fluctuation of the Tekes Kapuqi station is close to the C_v value of its

annual fluctuation. However, the C_v value of spring discharge at the Xi River Hongshawan station is 3.2 times that of its annual discharge.

In terms of water needs for irrigation agriculture, the important season is between April and October in the north, and between March and November in the south. Based on the characteristics of its seasonal fluctuation, the Ili River drainage system is most advantageous to supplying water for agriculture, in which spring floods occur in close conjunction with summer floods, and water is relatively plentiful from May to August. Although spring floods are common to runoff on the northern slopes, they are short-lived. If summer flood waters do not come on time in May, subsequent droughts may frequently affect agriculture. Spring floods are even more uncommon on the southern slopes, and spring droughts become more serious. In summary, the key to successful agriculture depends on the spring season. In order to ensure supply of water during the spring, some large scale reservoirs need to be built so that annual and seasonal water supply can be regulated.

III. Floods and Underground Water

The greatest runoff volume in the Tien Shan Mountain region comes during the summer, especially in July and August, when there is a combination of glacial meltwater, rainfall, and rainstorms. Compared to other regions in the country, the Tian Shan Mountain region has fewer severe floods resulting from rainstorms; neither are there flood waters resulting from seasonal meltwater such as those in the northeast and the Altai region. In the Tian Shan Mountain region, the causes of floods are quite complicated. This is one of the major heavy rainfall areas of Xinjiang Province (a rainstorm is defined as precipitation of more than 30 millimeters within 24 hours). During May and June, floods occur frequently as a result of a combination of seasonal meltwater and rainfall (rainstorms). In July and August, floods result from a combination of glacial meltwater and rainstorms.

There is a significant regularity in the vertical zonation of flood waters in the Tian Shan Mountain region. In mountainous areas between 3,000 to 4,000 meters high, summer precipitation comes in the form of light snowfall. Hence, floods in this location are mainly the result of meltwater. In middle altitudes, rainfall is concentrated during the summer, when rainstorms are frequent, and hence floods are mainly the result of rainfall. These conditions are reflected in the graph of water discharge at the foothills. As a rule, during the summer season, floods resulting from orographic rainfall, reflected in the form of a toothlike graph, exceed those resulting from meltwater. Floods caused by rainfall provides approximately the basic channel discharge. In certain circumstances, summer floods take place as a result of a sudden increase in glacial meltwater caused by strong radiation in clear weather, particularly in years when rainfall is below normal. Similarly, but in different circumstances, rainstorms in middle altitudes can produce floods or even mudflows. For example, in August 1958, rainstorms turned the normally dry gully near Kuqa, at an elevation of 1,000 to 1,600 meters, into a torrent with a flow of 1,220 cubic meters per second, having collected water from an area of 500 square kilometers.

Based on an analysis of existing survey data, the timing of maximum runoff volume among the various rivers of the Tian Shan Mountain region varies. High water was recorded on the northern slopes in 1969, southern slopes in 1958, and largely in the eastern section in 1961. The maximum water discharge decreases with increase in the size of the catchment area. For example, the indices of water discharge at the Yamadu station on the Ili River and the Bairji station on the Kaidu River are lower than those of other rivers.

The ratio between maximum water discharge and the average annual discharge reflects the scale of floods. The average ratio is above 50 for most rivers in the Tian Shan Mountain region, less than 20 on the northern slopes, and more than 30 on the southern slopes. The minimum is 5.7 at the Yamadu station on the Ili River, and the maximum is 170 at the Langan station on the Kuqa River.

As can be seen in the above, floods in the Tian Shan Mountain region which originate merely from meltwater are rare. But floods which result from rainstorms often create major threats to industry, agriculture, transportation, safety, and property on the surrounding lowland. These floods are characterized by suddenness, and are often mixed with mudflows, such as the one which took place at the Kuqa area in August 1958. Hence, it is a meaningful endeavor to strengthen forecast and research work on the incidence of floods resulting from rainfall.

The lowest water discharge among rivers in the Tian Shan Mountain region often takes place during the winter, particularly in January. At that time, the rainy season is over, and meltwater stops coming. Rivers rely on underground water as a source of supply. A few rivers with large drainage basins can still gather a relatively large amount of underground water, and they can still maintain a certain water level during the winter. Besides, it also depends on the geology of the drainage basin above measurement stations. For instance, the Kuytun River and the Bayingou are near each other, and their catchment areas are similar in size; but the minimum water discharge of the former is 2.66 cubic meters per second, whereas the latter's minimum is 0.061.

Some rivers in which the proportion of glacial meltwater is low and which mainly relies on the supply of rainwater, such as the Urumqi River and the Huangshuigou, generally have minimum flow during the spring. Some other rivers which lose part of their volume via basins also have minimum flow during the spring, such as those recorded on the Bairji station on the Kaidu River, and the Qianfodong station on the Weigan River (see Table 4).

Judging from the ratio between the average annual flow and the absolute minimum flow, it can be seen that among the various rivers in the Tian Shan region, the main rivers show relatively greater variations. The lowest ratio is found on the Kaidu River, the Ili River, and the Weigan River, where the ratio is only around 5. The highest ratio is found on the Bayingou,

IV. Sediments and Chemical Composition

Compared to other regions in the country, the rivers in the Tian Shan Mountain region carry very limited suspended load. On the whole, the amount is between 0.5 to 3.0 kilograms per cubic meter. The average annual load is 2.61 at the Xidaqiao on the Aksu River, 2.08 at the Hongshanzui station on the Manas River, and 0.539 at the Mamadu station on the Ili River. Rivers which traverse intermontane basins (such as the Greater and Smaller Yourdous basins) carry even less load. At the Yanqi station, the Kaidu River carries a load of only 0.295 kilograms per cubic meter.

The sediment content in this region shows significant regular vertical zonation, which is in accordance with the source of water supply. Rivers which originate from glacial meltwater carry limited load at their source areas. The sediments are relatively fine and they also show a certain color. In the case of the Kumalik River, the color is milky white. In the middle course of a river, the amount of sediment begins to increase. The accumulation of sediment accelerates in the lower course, a result of a combination of factors such as geology, rainstorms, slope conditions, and vegetation cover. At the Langan station on the Kuqa River, which relies mainly on rainwater supply, the average annual load of the river reached 28.0 kilograms per cubic meter in 1958, exceeding the average annual load measured at the Lijin station on the Yellow River.

One characteristic of the annual variations of sediment content in the rivers of the Tian Shan Mountain region is, for rivers which experience spring floods and which have large catchment areas, the greatest sediment accumulations appear before the period of the highest water, as in the case of Madu station on the Ili River (Figure 6). This is due to the fact that at the end of the spring flood, the river bed is overlaid with vast amounts of debris. Upon the coming of the summer flood, this debris is quickly washed away, but at the time of maximum water flow, the erosional power of the river is unable to remove all the sediments which continue to enter the river.

Based on substantiated information, the erosional power of the rivers in the Tian Shan Mountain region is similar to that of most regions in the country, that is, between 50 and 200 tons per square kilometer per year. Only in restricted areas, such as the section from Kuqa to Aksu, will the load reach 1,000 tons per square kilometer year.

In addition to suspension load, the bedload of the rivers in the Tian Shan Mountain region is also quite remarkable. Such load appears during flood periods. Based on estimation, the bedload of the Xiangbeipo Bayingou comprises 12 to 15 percent of all sediments in the river, an amount which can greatly jeopardize construction work on the river.

The chemical composition of the rivers in the Tian Shan Mountain region is relatively simple, its main component being calcium bicarbonate. In the Ili

River, the water is strong in sodium bicarbonate. In the lowlying areas, the composition changes into sodium chloride and sodium sulfate.

Compared to the eastern regions of our country, the main features of the chemical composition of the rivers in the Tian Shan Mountain region are high mineral content and significant vertical zonation. By the time rivers reach their lower middle course or their lower course, their mineral content has increased from 100 to 200 milligrams per pint to 200 to 500. On average, the mineral content of the Ili River (Yamadu station) is approximately 260 milligrams per pint, and that of the Hongshanzui station on the Manas River is 200. In terms of cations, both stations are rich in Ca^{++} ions; in terms of anions, HCO_3^- predominates. On the southern slopes of the Tian Shan Mountain, the mineral content of rivers increases rapidly as they traverse the folded rocks of the late Mesozoic period, especially at the beginning of summer rainstorms. The salt accumulated on the ground surface is being corroded in vast quantities, and the mineral content of the rivers reaches high proportions. In 1958, the mineral content of the Yanshuigou on the Kuqa River reached 13 grams per pint at the later stages of a rainstorm.

The chemical composition of rivers in the Turpan Depression shows a remarkably significant degree of vertical zonation. The mineral content of rivers from the Bogda Mountain is less than 200 milligrams per pint. Their mineral content increases to a range between 200 and 500 as they travel through the northern slopes of the Huoyan Shan; 500 to 1,000 as they reach the southern slopes of the Huoyan Shan; one to three grams per pint near the center of the basin, and over three grams per pint as they reach the vicinity of Aiding Lake.

V. Summary

Like other arid regions of our country, the Tian Shan Mountain region exhibits special drainage characteristics. Among the latter features, regular vertical zonation is the most significant. This characteristic feature not only affects the various aspects of drainage, it is also the major feature which distinguishes this region from all others. It is generally recognized that the vertical profile of arid drainage can be divided into a drainage formation section and a drainage dispersal section. Their main features can be seen in Table 5.

Figure 1

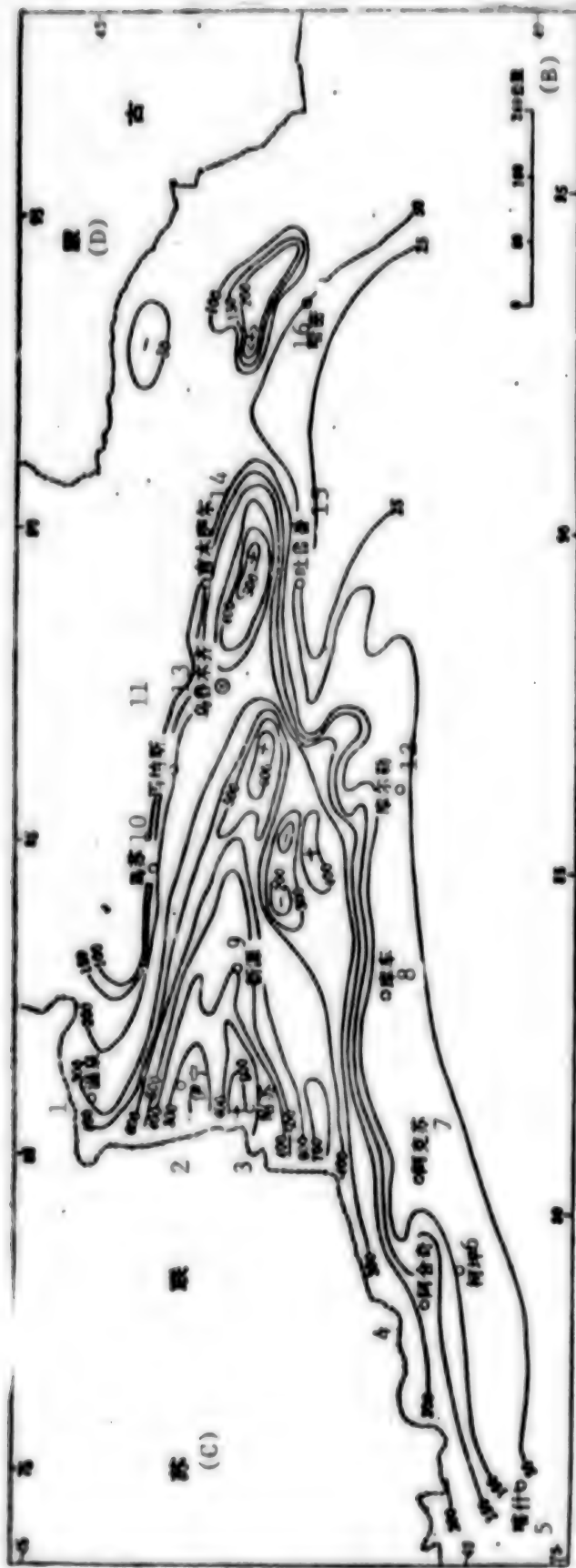


图1 天山地区年降水量图(单位: 毫米) (A)

KEY:

(A) Figure 1. The Annual Rainfall Distribution in the Tian Shan Region (Unit: Millimeters)

(B) Kilometers

(C) Soviet Union

(D) Mongolia

1. Wenquan

2. Yining

3. Zhaoasu

4. Akqi

5. Kashi

6. Kalpin

7. Aksu

8. Kuqa

9. Xinyuan

10. Usu

11. Manas

12. Korla

13. Urumqi

14. Jimsar

15. Turpan

16. Hami

Figure 2

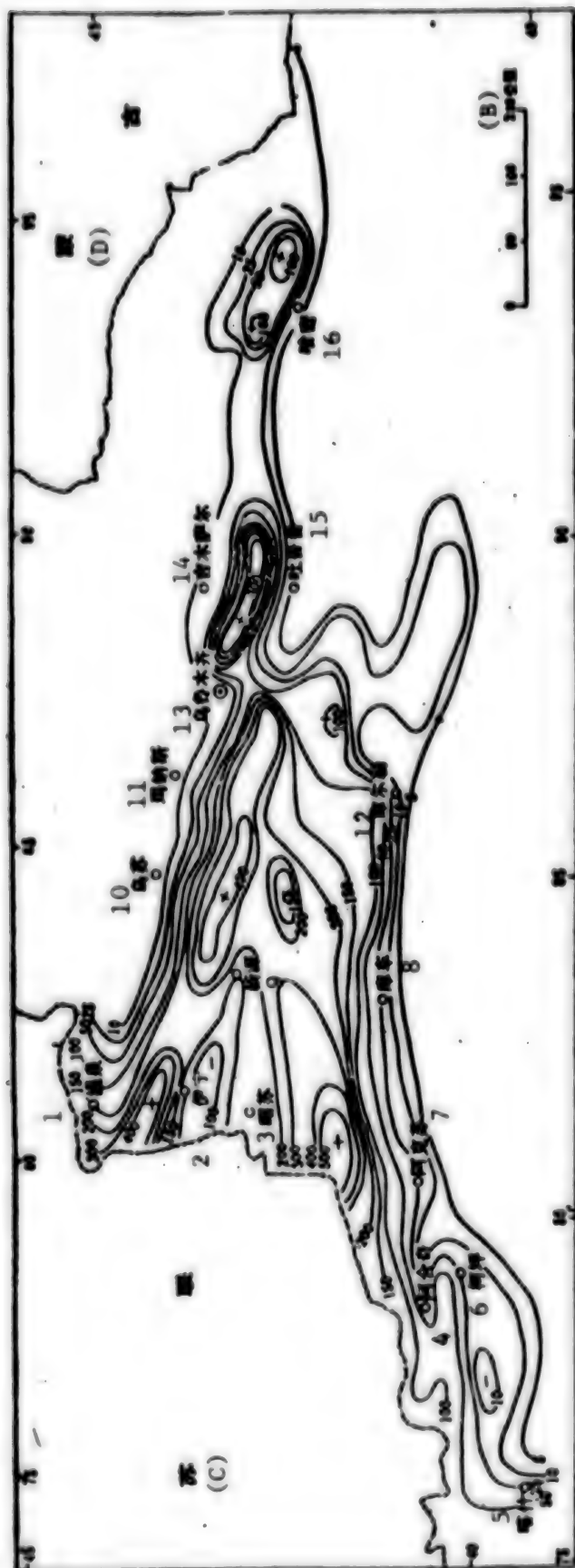


图2 天山地区年径流量等值线图(单位: 毫米) (A)

KEY:

(A) Figure 2 Map of Channel Depth of Perennial Streams in the Tian Shan Mountain Region

(Unit: Millimeters)

(B) Kilometers

(C) Soviet Union

(D) Mongolia

1. Wenquan

2. Yining

3. Zhaosu

4. Akqi

5. Kashi

6. Kalpin

7. Aksu

8. Kuqa

9. Xinyuan

10. Usu

11. Manas

12. Korla

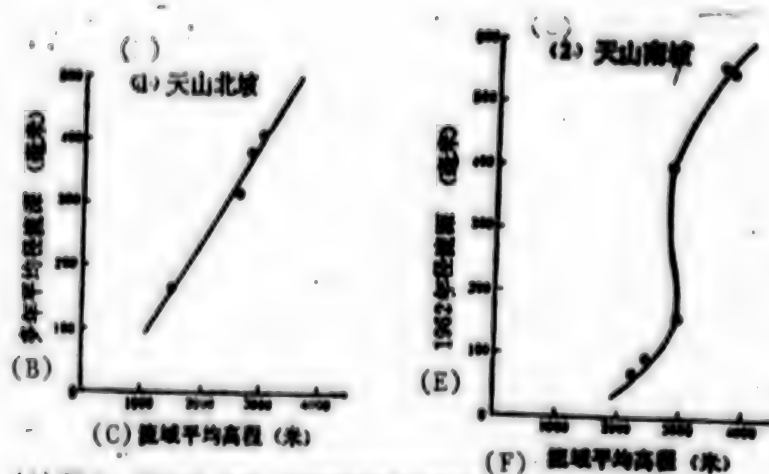
13. Urumqi

14. Jimsar

15. Turpan

16. Hami

Figure 3



(A) 图 3 天山南、北坡一些河流年径流深度与流域平均高程相关图

- KEY: (A) Figure 3 Graphs Showing the Correlation between Channel Depth and Basin Elevation of Selected Streams on the Northern and Southern Slopes of the Tian Shan Mountain Region
- (B) Average Annual Channel Depth (Millimeters)
- (C) Average Basin Elevation (Meters)
- (D) Northern Slopes of Tian Shan Mountain
- (E) Channel Depth in 1962 (Millimeters)
- (F) Average Basin Elevation (Meters)
- (G) Southern Slopes of Tian Shan Mountain

Figure 4

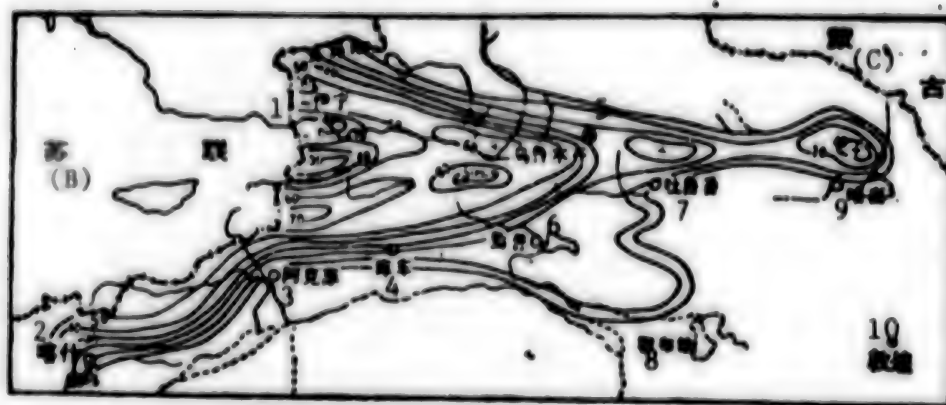


图 4 天山地区年径流系数图(单位: %) (A)

KEY: (A) Figure 4 Coefficients of Perennial Streams in the Tian Shan Mountain Region (Unit: %)

(B) Soviet Union

(C) Mongolia

1. Yining
2. Kashi
3. Aksu
4. Kuqa
5. Urumqi
6. Yauqi
7. Turpan
8. Lop Nur
9. Hami
10. Dunhuang

Figure 5

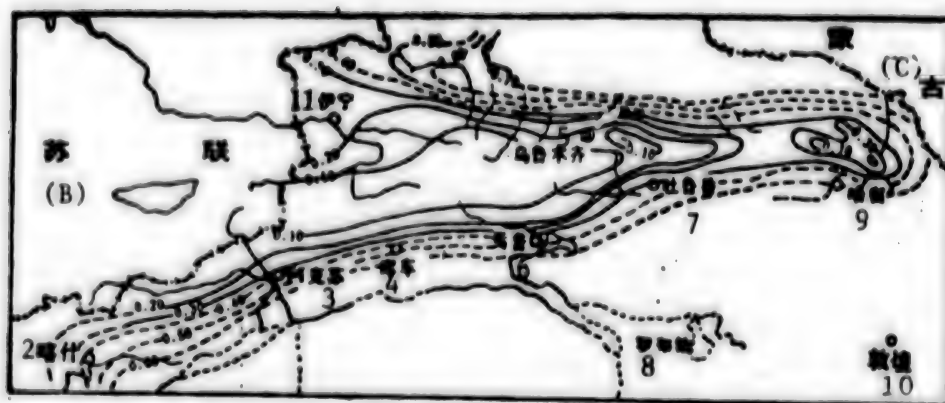


图 5 天山地区年径流变差系数图 (A)

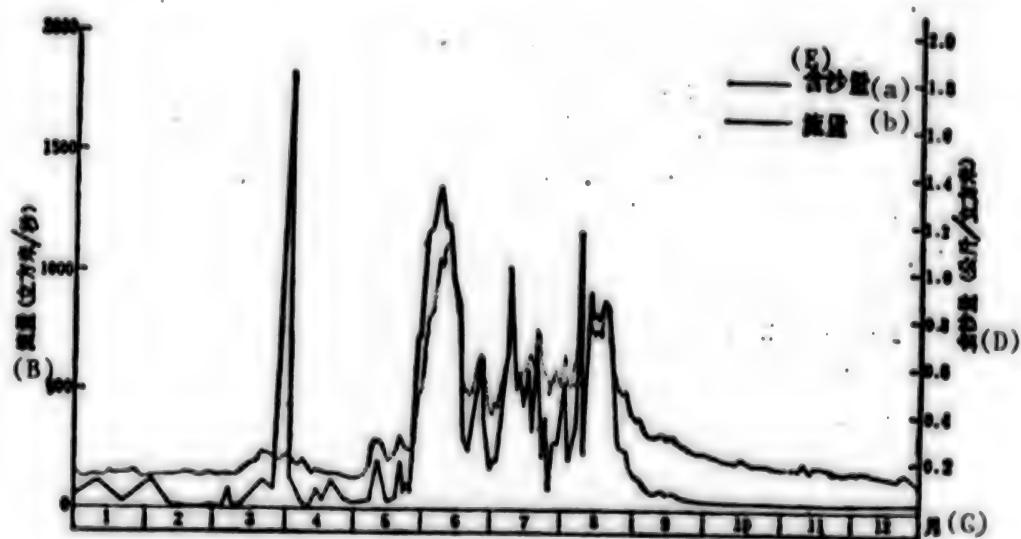
KEY: (A) Figure 5 Variation Coefficients of Perennial Streams in the Tian Shan Mountain Region

(B) Soviet Union

(C) Mongolia

1. Yining
2. Kashi
3. Aksu
4. Kuqa
5. Urumqi
6. Yauqi
7. Turpan
8. Lop Nur
9. Hami
10. Dunhuang

Figure 6



(A) 图 6 伊犁河雅马度站 1957 年逐日平均流量、含沙量过程线

KEY:

- (A) Figure 6 Graph Showing Daily Water Discharge and Load in 1957 of the Yamadu Station on the Ili River
- (B) Water Discharge (Cubic meter per second)
- (C) Month
- (D) Load (Kilograms per cubic meter)
- (E) a. Load
b. Discharge

Table 1

(A) 表 1 天山主要河流年径流量统计							
(B) 河 名	(C) 站 名	(D) 集水面积 (平方公里)	(E) 河 长 (公里)	(F) 多年平均年径 流量(亿立方米)	(G) 多年平均流量 (秒立方米)	(H) 年径流量 (毫米)	(I) 实测年份
1 伊犁河	雅马渡	48,421	376	123	390	254	1954—1973
2 区里青河	区里青	900	53	1.866	5.56	207	1957—1973
3 切得克河	切得克	270	39	1.560	4.94	578	1957—1974
4 纳 河	纳河山口	1,169	49	4.769	15.1	408	1957—1974
5 四棵树河	吉勒德	748	52	2.911	9.22	389	1954—1975
6 奎屯河	加勒果拉	1,564		6.082	19.3	389	1959—1975
7 巴音沟	黑山头	1,575		3.127	9.91	198	1959—1971
8 金沟河	红山头	1,988	47	3.234	10.1	163	1955—1971
9 乌纳斯河	红山咀	4,056	156	12.78	40.5	315	1954—1973
10 塔西河	石门子	1,027		2.315	7.73	225	1963—1972
11 呼图壁河	卡勒格牙	2,948	150	4.978	15.8	169	1957—1966
12 三屯河	嘎 官	1,390		3.307	10.5	238	1964—1973
13 头屯河	哈地坡	1,417	75	2.411	7.64	170	1956—1973
14 乌鲁木齐河	英越桥	952	58	2.288	7.25	240	1958—1973
15 开垦河	开 垦	488	21	1.668	5.28	342	1957—1973
16 清水河	克尔古提	465	26	1.131	3.59	243	1956—1971
17 黄水沟	黄水沟	4,375	80	2.723	8.63	62.2	1955—1971
18 开都河	拜尔基	19,022	352	35.17	112	18.5	1955—1971
19 迪那河	迪 那	1,820	79	3.407	10.5	187	1956—1971
20 库车河	兰 干	3,157	97.5	3.320	10.5	105	1957—1976
21 渭干河	千佛洞	16,299	128	22.52	71.4	138	1953—1971
22 台兰河	台 兰	1,338	53	7.270	23.0	543	1957—1976
23 阿克苏河	西大桥	35,871	419	61.60	195	172	1952—1966

KEY: (A) Table 1 Statistics on the Annual Water Discharge of
the Major Streams in the Tian Shan Mountain Region

(B) Name of Stream

(C) Name of Station

(D) Catchment Area (Square Kilometers)

(E) Length of Stream (Kilometers)

(F) Average Annual Water Discharge (100 million cubic meters)

(G) Average Water Discharge (Cubic meters per second)

(H) Average Channel Depth (Millimeters)

(I) Year of Survey

(continued next page)

<u>Name of River</u>	<u>Name of Station</u>
1. Ili R.	Yamadu
2. Piliqing R.	Piliqing
3. Qiedeke R.	Qiedeke
4. Jing R.	Jingheshankou
5. Sikeshe R.	Jinede
6. Kuytun R.	Jianeguola
7. Bayingou	Heishantou
8. Jingou R.	Hongshantou
9. Manas R.	Hongshanzui
10. Taxi R.	Shimenzi
11. Hutubi R.	Kanegeya
12. Santun R.	Qushou
13. Toutun R.	Hadipo
14. Urumqi R.	Yingxiongqiao
15. Kaiken R.	Kaiken
16. Qingshui R.	Kerguit
17. Huangshui R.	Huangshuigou
18. Kaidu R.	Bairji
19. Dina R.	Dina
20. Kuqa R.	Langan
21. Weigan R.	Qianfodong
22. Tailan R.	Tailan
23. Aksu R.	Xidaqiao

Table 2

(A) 表 2 天山—帕米尔高山冰雪融水占年径流百分比

坡 向 (B)	河 名 (C)	站 名 (D)	高山冰雪融水占年径流% (E)
1 北坡	伊 犁	雅 马 敏	40
2 北坡	特 克 斯	卡甫其海	47
3 北坡	玛 纳 斯	红 山 咀	47
4 南坡	木 札 特	阿合不隆	64
5 南坡	昆马立克	协 合 拉	53
6 南坡	鹿克沙尔	阿 合 奇	52
7 南坡	台 兰	台 兰	57
8 南坡	庙 尔 沟	山 口	45
9 南坡	榆 树 沟	山 口	51

KEY: (A) Table 2 Percentage of Glacial Meltwater in Selected Streams
in the Tian Shan Mountain Region

(B) Slope

(C) Name of Stream

(D) Name of Station

(E) Percentage of Glacial Meltwater in Annual Discharge

	<u>Slope</u>	<u>Name of Stream</u>	<u>Name of Station</u>
1.	Northern Slope	Ilı	Yamadu
2.	Northern Slope	Tekes	Kapuqihai
3.	Northern Slope	Manas	Hongshanzui
4.	Southern Slope	Muzhate	Ahebulong
5.	Southern Slope	Kunmalik	Xiehela
6.	Southern Slope	Langkeshar	Aheqi
7.	Southern Slope	Tailan	Tailan
8.	Southern Slope	Miaorgou	Shankou
9.	Southern Slope	Yushugou	Shankou

Table 3

		(B)	(A)	表 3 天山主要河流各月径流量占年径流量百分比												(E)
(B)	河名 站名	集水面积 (平方公里)	(D)	1月	2月	3月	4月	5月	6月	7月	8月	9月	10月	11月	12月	
1	伊犁 赛马渡	48421		3.2	3.2	4.2	5.7	9.8	17.1	17.7	16.8	8.6	5.2	4.6	3.9	1954—1971
	玛纳斯 红山咀	4056		2.1	2.0	2.2	2.5	4.5	14.3	27.7	24.8	9.8	4.6	3.1	2.4	1954—1971
3	开都 焉耆	20705		4.3	4.8	5.3	8.5	9.3	12.5	15.9	14.9	7.9	5.9	5.8	4.9	1949—1970
4	阿克苏 西大桥	35871		3.5	3.5	3.2	2.5	4.0	11.9	20.2	25.5	11.9	5.3	4.4	4.1	1952—1971

- KEY: (A) Table 3 Percentage of Monthly Discharge in Total Annual Discharge in the Major Streams of Tian Shan Mountain
- (B) Name of Stream Name of Station
- (C) Catchment Area (Square Kilometers)
- (D) Month (January ... December)
- (E) Duration of Survey
1. Ili Yamadu
2. Manas Hongshanzui
3. Kaidu Yanqi
4. Aksu Xidaqiao

Table 4

(A) 表4 天山主要河流历年最大流量与最小流量统计

(B) 名	(C) 站名	(D) 集水面积 (平方公里)	(E) 最大流量 (秒立方米) (年.月.日)	(F) 最小流量 (秒立方米) (年.月.日)	(G) 统计年限
1 伊犁河	雅马渡	4,8421	2,220 1963.6.3	76.6 1954.1.22	1954—1973
2 匹里青河	匹里青	900	113 1969.5.30	0.575 1962.12.27	1957—1973
3 精河	精河山口	1,169	251 1964.7.6	0.460 1967.12.25	1957—1971
4 奎屯河	加勒果拉	1,564	173 1964.8.3	2.66 1969.1.31	1959—1971
5 巴音沟	黑山头	1,575	325 1967.7.17	0.061 1966.11.30	1959—1971
6 玛纳斯河	红山咀	4,056	650 1966.7.28	2.00 1964.1.23	1954—1973
7 头屯河	哈地坡	1,417	478 1965.7.1	0.295 1970.1.20	1956—1973
8 乌鲁木齐河	英建桥	952	161 1969.6.26	0.428 1969.3.6	1958—1973
9 清水河	克尔古塘	465	149 1958.8.14	0.48 1956.5.31	1956—1971
10 黄水河	黄水沟	4,375	371 1969.6.26	1.66 1962.4.18	1955—1971
11 开都河	拜尔基	19,022	883 1969.6.25	31.2 1957.11.22	1955—1971
12 库车河	兰干	3,157	1,940 1958.8.13	0.62 1966.5.24	1957—1971
13 渭干河	千佛洞	16,299	1,840 1958.8.13	14.4 1958.5.30	1953—1971
14 台兰河	台兰	1,338	531 1957.7.23	2.33 1963.1.31	1957—1971
15 阿克苏河	西大桥	35,871	2,160 1956.7.24		1952—1966

KEY: (A) Table 4 Statistics on the Absolute Maximum and Absolute Minimum Water Discharge in the Major Streams of the Tian Shan Mountain Region

(B) Name of Stream

(C) Name of Station

(D) Catchment Area (Square kilometers)

(E) Absolute Maximum Discharge (cubic meters/second, Year·month·day)

(F) Absolute Minimum Discharge (cubic meters/second, Year·month·day)

(G) Years of Statistics

1. Ili R. Yamadu
2. Piliqing R. Piliqing
3. Jing R. Jingkeshankou
4. Kuytun R. Jianeguola
5. Bayingou Heishantou
6. Manas R. Hongshanzui
7. Toutun R. Hadipo
8. Urumqi R. Yingxiongqiao
9. Jingshui R. Kerguti
10. Huangshui R. Huangshuigou
11. Kaidu R. Bairji
12. Kuqa R. Langan
13. Weigan R. Qianfodong
14. Tailan R. Tailan
15. Aksu R. Xidaqiao

Table 5

(A) 表5 径流形成带与径流散失带在水文上的主要表现

(B) 径流形成带	(C) 径流散失带
1 1. 河川径流量随集水面积而增加 2 2. 河水矿化度较低, 水质良好 3 3. 河水挟带一定数量泥沙, 是侵蚀区。 4 4. 由地下水补给地表水 5 5. 水系发育, 河网密度较高	6 1. 河川径流量随集水面积增加而减少 7 2. 河水浓缩作用强烈, 矿化度激增 8 3. 河水挟沙逐渐沉淀, 是沉积区 9 4. 由地表水补给地下水 10 5. 河川无支流汇入, 最后湖如咸湖或消失于荒漠

KEY: (A) Table 5 Major Features of Drainage Formation Zone and Drainage Dispersal Zone

(B) Drainage Formation Zone

(C) Drainage Dispersal Zone

1. Water Discharge increases in proportion to the increase in the catchment area
2. Mineral content in water is low, quality of water good
3. Water carries a certain load in suspension, a zone of erosion
4. Underground water adds to surface runoff
5. Drainage system develops, stream density is high
6. Water discharge decreases in inverse proportion to the increase in the size of the drainage basin
7. High corrosive power, mineral content increases rapidly
8. Suspended load begins to deposit, a zone of deposition
9. Surface runoff supplies underground water
10. No tributaries joining the main stream, disperse into lakes or disappear in desert

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3. Zhongguo ke xue yuan di li yan jiu suo bing chuan dong dong tu yen jiu shi, "Research on Glaciers and Drainage on the Urumqi River in the Tian Shan Region," 1965, ke xue chu ban she.
4. Fan Ximing, "A Discourse on Drainage Factors Leading to the Formation of Underground Water at Foothill Areas in Arid Regions," Di zhi xue bao, No. 1, 1962, ke xue chu ban she.

9471

CSO: 8111/0608

LIFE SCIENCES

PROTECTING HUMAN BODIES IN SPACE FLIGHT DISCUSSED

Beijing BEIJING RIBAO in Chinese 10 Oct 79 p 3

[Article by Feng Genquan [1409 2704 3123], research assistant in the Institute of Psychology of the Chinese Academy of Science: "Space Flight and Space Medicine"]

[Text] Since 1783 when man first ascended into the air with a balloon, a period of less than 200 years, men have not only ridden into the age of the airplane, but moreover have entered the age of space flight. Up to now, over 100 men have gone into outer space. But because of this to think that space flight is a purely technological task is a mistake. To give a simple example: because of its extremely high speed when a spaceship returns and enters the earth's atmosphere, the heat produced by the friction between the spaceship's outer shell and the air can reach several thousand degrees, so that if methods of protection were not devised, in the end, the human body would be burned to ashes. However, high temperature is not the only environmental condition harmful to the human body encountered during the flight of a spaceship. In order to solve this type of problem, the task of ensuring the safety, health, and work efficiency of the human body during space flight, a new branch of medical science has been founded that is called space medicine.

How has space medicine established methods to protect a spaceman?

To Begin With the Spacecraft's Takeoff

When a spaceship takes off it first runs into the problem of excessive weight. This phenomenon is a function of acceleration and causes the force of gravity to be greatly increased. The direction of this thrust is from the head to the feet, so that in the end the blood's pressure will be increased and it will certainly flow to the lower half of the body. With this, the head and especially the brain will develop a shortage of blood. In a severe case there will be manifested an impairment of vision or even a loss of consciousness. Because the four limbs and internal organs increase in weight and fall down under the effects of this increased weight, on the one hand difficulty in moving the four limbs develops, while on the other hand, the functioning of the internal organs is also affected, such as breathing difficulties increasing. When the

increased weight reaches three or four times the force of gravity on earth and is prolonged, most people have difficulty enduring it. However, if a person's body is turned horizontal, causing the direction of the increased weight to be from chest → back or back → chest, then a person's endurance can be greatly increased and even an extreme of six or seven times the force of gravity on earth can be endured. Therefore, if his posture is made appropriate and he is allowed to semi-sit in a form-fitting couch of a moulded material and, when needed, he breathes pure oxygen and takes other protective measures, a person can endure even 12 to 15 times earth's gravity and still even make small movements of the wrists and ankles.

After the spacecraft enters orbit, the rocket burns out, and the spacecraft, depending on its own inertia in space, is in powerless free flight, all objects in the spacecraft lose their weight. This phenomenon is called weightlessness. Most people can adapt to weightlessness, but when they remain in a weightless condition for a long time a person's muscles lose strength and the bones become disjointed, and this influences the spaceman's ability to endure the great weight during the spacecraft's return and his ability to readapt to the earth's gravity afterward. In the early period of space flight, spacemen returning after 7 days were unable to stand up by themselves and needed a doctor to help them out of the capsule. But this no longer is important; they only needed every day while in space to exercise for about 2 hours and also to fortify their food with vitamins, calcium, phosphorus, potassium, and so on, then this problem was basically solved.

Blood Boils

In outer space there is little atmosphere (it approaches a vacuum) and most people at an altitude of 3,500 meters or more will develop fatigue, headache, loss of vision, and other symptoms of oxygen deficiency; since the air pressure is low when above 8,000 meters, even with a sufficient supply of oxygen, some people show symptoms of pain in their joints and impairment of circulation. When the altitude reaches more than 19 kilometers, since the air pressure is too low, the blood starts to boil and if there is no proper protection, a person is entirely without means to survive. In order to solve this problem spaceships generally utilize a sealed capsule, so that within the passenger compartment there are conditions that protect the human body with suitable air pressure and oxygen. At times when an astronaut needs to work outside of that cabin he wears protective clothing that fully encloses the body and is pressurized, which is called a spacesuit. A spacesuit cuts off the human body from the outside world, and within the suit the air pressure and oxygen conditions necessary to protect the human body are provided.

From High Temperatures to Low Temperatures

When a spaceship takes off and returns, it encounters high temperatures; but at night after entering outer space, it can get as cold as several tens of degrees below zero, while on the surface of the moon it can encounter temperatures as low as 160 degrees below zero. Not only is a person's endurance at high temperatures limited, but so is his endurance of low temperatures, because when a person remains under low temperature conditions for a long

time, his body temperature will fall, and when the body temperature falls below 34 degrees it shows amnesia, stuttering, and impairment of spatial orientation. When it falls to 27 degrees, then numbness and death occur. But now people have already developed very effective protective clothing. Inside this type of protective clothing is used fine tubing woven into a mesh through which is circulated cold water or warm water, cold air or warm air, to ward off the high or low temperatures outside of the unit. At the same time, within the spaceship's cabin, there is also thermostatic-controlled equipment to assure that the temperature is suitable for the human body.

The Uses of Cosmic Rays

People call the electro-magnetic radiation in space cosmic rays. They can cause an irradiated material to produce electricity, but the human body's tissues when exposed to cosmic radiation will be greatly damaged. Cosmic rays have three important sources: the Milky Way's cosmic radiation, radiation belts around the earth, and solar eruptions. The Milky Way's cosmic radiation is not too intense, so that generally a spaceship's outer shell will block it. The earth's radiation belts do not spread to the regions of the north and south poles. Therefore, a spacecraft can fly away from the earth at the arctic or antarctic regions and go around them. But the strength of the electro-magnetic radiation from solar eruptions is too great. At present there are still no reliable protective measures, so we are only able to rely on predictions and forecasts to avoid them.

Sanitary and Medical Safeguards

Fuel, waste gases, plastics, rubber, paint, and so on can produce contamination. The human body, which itself gives off products that include over 400 kinds of material, is also an important source of contamination. Because if these contaminants accumulate over a long period they can reach concentrations harmful to the human body, it is necessary periodically to eliminate them and to wash the ship clean. In 1976, the crew of the Soviet Soyuz 23 had to return prematurely because their space station produced noxious odors.

A person daily requires 4 kilograms of oxygen, food, and water and 1 kilogram of water for sanitation. During prolonged space flight, it is inconvenient to rely entirely on on-board stores of these things. Physical and chemical methods are generally used to collect gases and water given off by the crew and use them to reproduce oxygen and fresh water to provide for human needs. As for eating in space, one wants only foodstuffs in small pieces that is well packaged in small sacks, that will not all float away under weightless conditions and can be eaten one mouthful or one piece at a time using a fork or chopstick without difficulty. However, a person cannot use a glass to drink water because the water would float all over his face, and he cannot use a straw because he would suck more air in than water. Because of this, one can only use a plastic bottle and squeeze the water into the mouth.

The rhythm of day and night in space is not the same as on the surface of the earth. For instance, an orbiting spaceship makes a complete orbit every 1 or 2 hours, which corresponds to one cycle of day and night, so that within 24 hours the ship would go through more than 10 days and nights. Each of man's

life functions has, during the course of evolution, long adapted to the earth's 24-hour rhythm of day and night and yearly rhythm of four seasons, so that if one day there occurs a change, the cyclical rhythm of the human body's life functions, such as breathing, circulation, excretion, and glandular excretions, is broken and disturbed. Within even a rather long period of time the human body cannot come close to adapting; this not only affects sleep and work efficiency but also influences general health. Therefore one must arrange a reasonable schedule of rest to protect against and to reduce these influences.

9504

CSO: 4008

FIFTY MILLION CHINESE PEASANT WOMEN GIVEN MEDICAL CHECKUPS

OW981238 Beijing XINHUA in English 1226 GMT 8 Mar 80 OW

[Text] Beijing, 8 Mar (XINHUA)--A general survey of women to determine the extent of common diseases such as cervical carcinoma, prolapse of the uterus, cervical erosion and urethrovaginal fistula has been conducted among 50 million peasant women over the past two years, according to the Ministry of Public Health. The ministry's programme for scanning women to discover gynaecological diseases will cover 120 million married women under the age of 60.

The majority of those suffering from complaints are receiving treatment and arrangements are being made for the remainder also to be treated.

The government listed treatment and prevention of prolapse of the uterus and the urethrovaginal fistula among the 12 major research items of the national maternity and child care programme in 1978. Special funds have been allocated to give free medical treatment to sufferers from these complaints.

In some areas, such as Chishui County, Guizhou Province and Lingshui County on Hainan Island, patients are given not only free medical treatment but also economic compensation during their hospitalization and financial aid for nourishment.

Meanwhile, the Ministry of Public Health has sent 30 teams of specialists to high-incidence areas and to parts of the country where medical service is deficient.

Doctors from county and commune hospitals, and more than one million bare-foot doctors, have cooperated in the work.

Because experienced doctors in cities and provinces having better medical facilities have helped train medical personnel in less fortunate areas, many local hospitals in smaller cities can now do surgical operations on the urethrovaginal passage as well.

Similar general check-ups were conducted in Shandong, Anui, Guangdong and other provinces in the past, but the programme presently being carried out is the biggest since liberation.

BRIEFS

NEUROSURGICAL STEREOTAXIC APPARATUS--Hofei, 27 Feb--One hundred seventeen sets of stereotaxic apparatus, used in neurosurgery, will soon be turned out in China, the first such apparatus to be produced here. The first such Chinese apparatus to be widely used was designed in this country in 1974 by Xu Jianping, chief neurosurgeon of the people's hospital of Anhui Province. Stereotaxic equipment is used for intracranial surgery, neurological disorders for removal of intracranial metallic foreign bodies such as bullet debris, as well as deep-seated brain tumors, for convulsions, mental disorders and other afflictions. Fixed to the skull of the patient at three points, the apparatus completes the localization procedure on the basis of x-ray projections of the brain, and can locate any small target in the brain. Xu Jianping began designing the apparatus in 1963. Before completion the cultural revolution broke and his work was stopped for a period. His hospital has since 1974 done some 160 stereotaxic operations with a success rate of over 90 percent. [OW281055 Beijing XINHUA in English 1251 GMT 27 Feb 80 OW]

FAMILY HYGIENE BOOK--Beijing, 29 Feb--Dr Lin Qiaozhi, China's leading gynaecologist, is chief editor of a new book, "Family Hygiene Adviser," which answers 700 questions through lively explanations and illustrations. Soon to be circulated nationwide, the book contains 13 chapters, including Childbirth, Mother's "ABC", Healthy Growth, How to Achieve Long Life, Prevention and Treatment of Common Illnesses, Home Nursing, Medicine, Nutrition, and Sanitation. Some 100 writers, including medical experts, took part in the work. [Text] [OW291121 Beijing XINHUA in English 0255 GMT 29 Feb 80 OW]

ANTICANCER SUBSTANCE SYNTHESIZED--Beijing, 3 Mar--An effective anticancer substance called homoharringtonine has been synthesized both at the Institute of Materia Medica under the Chinese Academy of Sciences and in the Chemistry Department of Lanzhou University. A detailed description of the partial synthesis of homoharringtonine is given in an article in the first issue to appear this year of ACTA PHARMACEUTICA SINICA. The article is written by Zhao Zhizhong, vice-president of the Institute of Materia Medica. Work to extract harringtonine and homoharringtonine from the cephalotaxux plant began in China in 1971. The study of partial synthesis of harringtonine was undertaken and China was first in the world to have succeeded in this, in 1975. The partial synthesis of homoharringtonine represents a further success. [Beijing XINHUA in English 1200 GMT 3 Mar 80 OW]

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

BIOGRAPHIC INFORMATION ON SCIENTISTS

[The following biographic information on selected scientists was extracted from the various Chinese-language newspapers as indicated in parentheses at the end of each name.]

Bei Shizhang [6296 2514 3864]

Director, Institute of Biophysics, Chinese Academy of Sciences.
(Beijing GUANGMING RIBAO 2 Jan 80 p 2)

Deng Liqun [6772 0500 5028]

Yu Guangyuan [0060 0342 6678]

Wu Guang [2976 0342]

Xu Dixin [6079 3321 2450]

Huan Xiang [1360 6743]

Zhang Youyu [1728 0645 3342]

Ma Hong [7456 3163]

Vice Presidents of the Chinese Academy of Social Sciences; all of them attended a tea party to celebrate the new year on 4 February 1980. (Beijing GUANGMING RIBAO 5 Feb 80 p 1)

Hu Han [5170 0698]

Director, Institute of Genetics, Chinese Academy of Sciences.
(Beijing GUANGMING RIBAO 2 Jan 80 p 2)

Huang Kun [7806 2492], Prof.

Director, Institute of Semiconductors, Chinese Academy of Sciences.
(Beijing GUANGMING RIBAO 2 Jan 80 p 2)

Li Guang [2621 0342]

Secretary of the CCP Committee, Changchun Institute of Optics and Precision Instruments, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 2 Feb 80 p 2)

Liang Jie [2733 0857]

President, Guangzhou Branch, Chinese Academy of Sciences; on 30 Dec 79 he attended a memorial service for He Jie [0149 2638], former vice president of Beijing Mining College who died on 21 Dec 79 in Guangzhou at age 91. (Guangzhou NANFANG RIBAO 11 Jan 80 p 4)

Lu Yanhao [4151 5888 6275]

Deputy Director, Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 22 Jan 80 p 2)

Ma Dayou [7456 1129 3731], Prof.

Ying Chongfu [2019 1504 4395], Prof.

Deputy Directors, Institute of Acoustics, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 1 Jan 80 p 2)

Wang Dezhaoh [3076 1795 2507], Prof. 王德昭

Director, Institute of Acoustics, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 1 Jan 80 p 2)

Xia Guanghua [1115 0342 5478]

Former deputy director, Institute of Economics, Shanghai Academy of Social Sciences; died on 5 Feb 80 at age of 60. (Shanghai JIEFANG RIBAO 22 Feb 80 p 2)

Yu Guanying [0151 0385 5391]

Deputy Director, Institute of Literature, Chinese Academy of Social Sciences. (Beijing GUANGMING RIBAO 2 Jan 80 p 2)

Zhang Zuoren [1728 0155 0086]

Chairman of the board of directors, Shanghai Municipal Zoology Society. (Shanghai WEN HUI BAO 21 Dec 79 p 1)

Zhou Kang [0719 2123]

Director, Institute of Philosophy, Shanghai Academy of Social Sciences. (Shanghai JIEFANG RIBAO 1 Jan 80 p 3)

Zhou Song [0719 1516]

Director, Institute of Pomology, Beijing Municipal Academy of Agricultural Sciences. (Beijing BEIJING RIBAO 29 Dec 79 p 6)

Zou Yuanxi [6760 0337 5764]

Director, Shanghai Institute of Metallurgy, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 3 Feb 80 p 2)

CSO: 4008

AUTHORS: WANG Wanyu [3769 1238 3842]
WANG Qifang [3769 0796 2455]
ZHANG Xueping [1728 7185 5493]
CHEN Youwei [7115 2589 3634]

ORG: Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming

TITLE: "A New Variety of *Bacillus Thuringiensis*--*B. Thuringiensis* var. *Yunnanensis*"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 117-121

TEXT OF ENGLISH ABSTRACT: A crystalliferous bacterium--strain "113" was isolated from a dead larva of the noctuid moth (*Prodenia litura* F.) found in a cotton field.

The morphological, physiological, biochemical and serological characteristics of strain "113" were compared with those of other varieties of the species. The results showed that this strain is clearly distinguishable from other strains so far reported.

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 117-121]

Thus the authors consider it as a new variety, and the name *Bacillus thuringiensis* var. *yunnanensis* var. nov. is proposed.

Colleagues PAN Shuying [3382 3219 5391] and MA Jun [7456 7486] took part in some of the experiments; electron microphotographs were taken by the Electron Microscope Office, Zhongshan University; and the Bacteria (from insects) Section of the Hubei Provincial Institute of Microbiology gave guidance and assistance in serological determination.

Received 11 Apr 1978.

AUTHORS: YAN Xunchu [0917 6676 0443]
ZHANG Guowei [1728 0948 0251]
XING Guixiang [6717 2710 7449]
CUI Siliie [1508 1835 0441]

ORG: YAN, ZHANG, XING of Institute of Microbiology, Chinese Academy of Sciences, Beijing, CUI of Department of Chemistry, Hebei Teachers College, Xuanhua

TITLE: "Three New Species of *Streptomyces* Decomposing Phosphopotassic Fertilizers"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 122-125

EXTRACT OF ENGLISH ABSTRACT: Three strains of *Streptomyces* able to decompose the phosphopotassic fertilizers was isolated from soil samples collected in rice fields of Hebei province, China. After taxonomic studies, they are found to be new species named *Streptomyces cinnamofuscus*, *S. flavoagglomeratus* and *S. violovariabilis*. The second species probably pertains to the genus *Actinosporangium*.

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 122-125]

The morphological and cultural characteristics of the three species are discussed.

The electron microphotographs were taken by the Electron Microscope Office, Institute of Biophysics, Chinese Academy of Sciences.

Received 11 Jul 1978.

AUTHORS: ZHANG Honglong [1728 7703 7893]
LIANG Soufang [2733 3359 5364]
WU Shuyun [0702 3219 0061]
WANG Fujin [3769 1381 6855]
GU Xiuyu [7357 4423 3768]
GUI Jinzhu [2710 6855 3796]

ORG: All of Shanghai Institute of Materia Medica, Chinese Academy of Sciences

TITLE: "Studies on the Antimetabolic Antibiotics I. Taxonomic Study on L-4-Oxaylsine Producer--*Streptomyces Roseoviridofuscus* N. Sp."

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 126-130

TEXT OF ENGLISH ABSTRACT: *Streptomyces* strain i-677 isolated from a soil sample collected in Dalian, China, produces an antimetabolic antibiotic, L-4-oxalysine. It shows inhibitory activities against five kinds of transplantable animal tumors. In addition, a significant effect in lowering the serum glutamic-pyruvate transaminase of chronic hepatitis patients has been noted.

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 126-130]

Streptomyces strain i-677 forms straight sporophores with rose aerial mycelium. Spores are cylindrical to oval with smooth surface. The substrate mycelium is green, turning to brown later on synthetic media. A brownish soluble pigment is produced.

According to its morphological, cultural and physiological characteristics, *Streptomyces* strain i-677 is different from other known species of *Streptomyces* hitherto described. Therefore, it is considered to be a new species and the name *Streptomyces roseoviridofuscus* n. sp. is proposed.

Professor YAN Xunchu [0917 6676 0443] of the Institute of Microbiology, Chinese Academy of Sciences, gave valuable comments in identifying *Streptomyces* strain. The electron microphotographs of spores were taken by the Fudan University and Electron Microscope Office, Institute of Biophysics, Chinese Academy of Sciences.

Received 30 Dec 1977.

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Beijing

TITLE: "Taxonomic Studies on the Genus *Phyllactinia* of China
III. *Phyllactinia* with Long Perithecial Appendages"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 131-145

TEXT OF ENGLISH ABSTRACT: Fifteen species of Chinese *Phyllactinia* with perithecial appendages 1.5-3 times as long as the diameter of the perithecium are described and illustrated. Latin diagnoses of the following ten new species are given: *Phyllactinia alangii* Yu et Lai sp. nov., *Ph. Caesalpiniae* Yu sp. nov., *Ph. corylopsidis* Yu et Han sp. nov., *Ph. elsholtziae* Yu sp. nov., *Ph. juglandis-mandshuricae* Yu sp. nov., *Ph. linderiae* Yu et Lai sp. nov., *Ph. Pteroceltidis* Yu et Han sp. nov., *Ph. pterostyracis* Yu et Lai sp. nov. and *Ph. toonae* Yu et Lai sp. nov. Differences between these fifteen species and their closely related species are briefly discussed. The synonymys of each species and its geographical distribution in China are also given. Type

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 131-145]

specimens of the ten new species are deposited in the Herbarium Mycologicum, Chinese Academy of Sciences, Beijing, China.

The emended description for *Phyllactinia guttata* (Wallr. ex Fr.) Lev. em. Yu is as follows: "Mycelium amphigenous, mostly hypophyllous, evanescent; perithecia scattered, or gregarious to scattered, depressed-globose to lenticular, 114-186 (m. 166.0) μ m in diameter; appendages 4-12 in number; usually 8-9, rigid or slightly curved, aricular, attenuate at the apex and bulbous at the base, 154-500 μ m in length, 1-2.5 times as long as diameter of the perithecium, usually 1.5-2 times, aseptate, hyaline; asci 7-13 in number, variable in shape, elongate-ellipsoidal or elongate-ovate, ovate or ellipsoidal or elongate-ovate, ovate or ellipsoidal, stalked, 61-88 x 24-45 μ m, ascospores 2-3 in number, usually 2, rarely 3, ovate or ellipsoidal, 24-40 x 17-25 μ m in size."

Many involved units and comrades throughout China furnished specimens; HAN Zhefang [7281 5074 5364] and JIAN Li [4675 5408] drew the drawings for the article; and WEI Jiangchun [7614 3068 2504] revised the Latin terms.

Received 24 Nov 1977.

AUTHOR: ZHAO Zhenyu [6392 7201 1342]

ORG: "August 1" Agricultural College, Urumqi

TITLE: "Taxonomic Studies on the Genus *Sphaerotheca* of China I. New Species, New Combination on Ranunculaceae, Cucurbitaceae and Campanulaceae"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 146-149

TEXT OF ENGLISH ABSTRACT: One new species and two combinations of the genus *Sphaerotheca* are reported. These new taxa are: *Sphaerotheca paeoniae* C. Y. Chao sp. nov. on *Paeonia hybrida* Poll. (Ranunculaceae), *Sphaerotheca cucurbitae* C. Y. Chao comb. nov. on *Cucurbita pepo* L., *C. moschata* Duchesne, *Lagenaria siceraria* (Molina) Standl. (Cucurbitaceae), and *Sphaerotheca codonopsis* C. Y. Chao comb. nov. on *Codonopsis clematidea* (Schrenk.) Chelake (Campanulaceae).

Type specimen of the new species mentioned above is deposited in Xinjiang "August 1" Agricultural College, Urumqi, China.

AN Zhengzhi [1344 1513 2520] and YANG Changyou [2799 2490 2589] of "August 1" Agricultural College identified host plants.

Received 5 Jun 1978.

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ORG: All of Institute of Microbiology, Chinese Academy of Sciences, Beijing

TITLE: "Studies on Immobilized Enzyme IV. Properties of Immobilized Glucoamylase

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 150-156

TEXT OF ENGLISH ABSTRACT: Glucoamylase (EC 3.2.1.3) of *Asp. niger* (M 85) has been partially purified by DEAE-cellulose column chromatography. The preparation shows no α -amylase activity under our assay conditions. Immobilized glucoamylase was prepared by covalent bonding of the purified enzyme to ABSE-cellulose.

Some characteristics of the immobilized enzyme and native enzyme have been comparatively investigated. The optimum pH for both enzymes was 4.5-4.6 and the temperature optimum for the immobilized enzyme was lower than that of

the native enzyme. The pH stability and thermal stability of bound glucoamylase were almost identical with those of the native one in the absence of substrate. However, the Michaelis constant (K_m) of bound glucoamylase for soluble starch, dextrans and maltose were 1×10^{-2} (g/ml), 1.66×10^{-2} (g/ml) and 2.7×10^{-3} (g/ml), respectively. While, those of the native one were 5.5×10^{-3} (g/ml), 4.7×10^{-3} (g/ml) and 1.49×10^{-3} (g/ml). The K_m value of immobilized enzyme was higher than that of the native one. The relative activity of immobilized enzyme toward substrates of different molecular weight differed from that of the native enzyme. The enzyme activity was inhibited by urea, while it was only slightly inhibited by Sn^{2+} , Al^{3+} , but not inhibited by metal chelating reagent such as EDTA.

Received 24 Mar 1978.

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ORG: Institute of Microbiology, Chinese Academy of Sciences, Beijing

TITLE: "Electron Microscopy of Spore Morphology of Some *Streptomyces* Species"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 157-159

TEXT OF ENGLISH ABSTRACT: Due to the lack of available instruments, some new species and new varieties of *Streptomyces* previously described missed the electron microscopies of spores. These photographs are published here in order to complete the determinative data.

The electron microphotographs were taken by the Electron Microscope Office, Institute of Biophysics, Chinese Academy of Sciences.

Received 8 Jun 1978.

AUTHORS: None

ORG: Group of Biological Nitrogen Fixation, Hubei Institute of Microbiology (Wuhan)

TITLE: "Study of Nitrogen-fixing Bacteria in Association with Maize Bio-Nitrogen Fixation Group"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 79 pp 160-165

TEXT OF ENGLISH ABSTRACT: A number of similar microorganisms possessing active nitrogenase activity were isolated from root-systems of maize, kaoliang and millet in Wuhan and Nanning. The characteristics of the strains 99 and 224 were examined and their property of nitrogen-fixation in association with maize were briefly studied.

Both strains are Gram-negative rods possessing a single polar flagellum. Motile. On nitrogen-free malate medium, spirals 1 to 1 1/2 rounds appear after 5-7 days incubation. Cells contain highly refractive lipid droplets. Catalase positive. V. P. and indole negative. Optimal temperature for growth and nitrogenase activity 32°C. Optimal pH 6.5-7.0. Nitrogenase activities

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 160-165]

amount to 600-1100 nM C_2H_2 reduced per gram root per hour have been detected after an induction period of 24 hours. There is no nitrogenase activity without a proper induction period.

In pot culture, the associated nitrogen fixation of strain 99 and maize has been proved.

The organism is identified as *Spirillum lipoferum*, as compared with Doberlener's culture ATCC 29145 (SP7).

Hubei Provincial Agricultural Institute, Guangxi Corn Research Institute, and Guangxi Institute of Chemical Industry gave support and assistance.

Received 1 Jul 1978.

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TITLE: "Bacterial Leaching of Albandite and Rhodochrosite"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 166-174

TEXT OF ENGLISH ABSTRACT: The bacterium *Thiobacillus ferrooxidans* has been used for the oxidation of ferrous sulfate to acidic ferric sulfate in aqueous solution. Within 2.5 hours 82 percent and 98 percent of manganese were

[Continuation of WEISHENGWU XUEBAO, No 2, Jun 79 pp 166-174]

released by stirred leaching from Albandite and Rhodochrosite respectively under conditions of ferric ion 25 g/l, pH 1.8, particle size 120 mesh, solid concentration 7 percent and leaching temperature 60°C. Except manganese silicate, 99.2 percent of extractable manganese mineral was released.

In the process of reaction, as all ferric iron precipitates as basic ferric sulphate, it can't be used for circulating leaching subsequently. However, basic ferric sulphate can be reduced to ferrous iron through absorbing low concentration of SO₂ eliminated from roasting desulfuration Albandite. After boiling and cooling of the newly formed ferrous iron, ferric sulfate may be regenerated by new inoculum, that repeats leaching again.

Taojiang Manganese Mine provided guidance and assistance in the experiments. The phase and total analyses of minerals were performed by the Analysis Laboratory, Institute of Metallurgy, Ministry of Metallurgy.

Received 16 Mar 1978.

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ORG: Qinghai Institute of Biology, Xining

TITLE: "Studies on Alkaloids of Fungi I. Screening of Alkaloid-Producing Fungi"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 175-179

TEXT OF ENGLISH ABSTRACT: Using the preliminary alkaloid precipitating method and confirmatory test with thin layer chromatography, the presence of alkaloids in fungal tissue extracts and in those obtained from the growth medium of 624 strains of lower fungi isolated from the soil of Qinghai-Xizang plateau was investigated. The results obtained showed that the number of fungal strains giving positive confirmatory alkaloid test was 114 or 18.2 percent.

Forty strains of fungi demonstrated comparatively strong positive confirmatory alkaloid test. These included the genera *Aspergillus*, *Penicillium*, *Fusarium*,

[Continuation of WEISHENGWU XUEBAO, No 2, Jun 79 pp 175-179]

Stemphylium, *Humicola* and *Mucor*. Besides *Penicillium cyclopium*, *Penicillium corylophilum*, *Penicillium lilacinum*, *Aspergillus ustus*, *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus* and *Aspergillus nidulans* had already been reported, but *Penicillium notatum*, *Penicillium biforme*, *Eupenicillium*, *Penicillium urticae*, *Penicillium nigricans*, *Fusarium equiseti*, *Fusarium trichothecioides*, *Fusarium camptoceras*, *Stemphylium botryosum* and *Humicola* sp. all have not been previously reported.

QI Zudong [7871 4371 3159], CHEN Qingtao [7115 1987 3447] and others of the Institute of Microbiology, Chinese Academy of Sciences, assisted in identifying fungal strains. ZHAO Lihua [6392 0448 5478], ZENG Youte [2582 0645 3676], and WU Cuizhen [0702 5050 3791] took part in some of the work.

Received 20 May 1978.

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TITLE: "Studies on the Selection of Leucine-Producing Mutants and Their Fermentation Conditions"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 180-186

TEXT OF ENGLISH ABSTRACT: A mutant AS 1.1004 producing a large amount of L-leucine was stepwisely derived from *Corynebacterium crenatum* AS 1.542 by N-methyl-N'-nitro-nitrosoguanidine continual treatment.

It was found that this mutant still required biotin as essential growth factor and that further addition of casein-hydrolysate also promoted its growth. The accumulation of L-leucine depended on the amount of biotin in a medium containing 5--50 µg/l of biotin. Glucose and NH_4Ac were the best carbon and nitrogen sources in fermentation tests.

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 180-186]

Yield of L-leucine was about 14 mg/ml in a medium containing 10 percent, glucose, 2 percent $(\text{NH}_4)_2\text{SO}_4$, 2 percent NH_4Ac , 0.1 percent KH_2PO_4 , 0.04 percent $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 2 mg/l $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 2mg/l $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$, 50µg/l biotin, 300 µg/l thiamine hydrochloride, 0.3 percent peptone, 0.3 percent yeast extract and 2 percent CaCO_3 , pH 7.2 on rotation shaker at 28°C for 4 days.

The product isolated from fermented liquid was identified to be L-leucine by element composition, infrared absorption spectrum, cellulose thin layer chromatography, specific rotation and bioassay.

Received 29 May 1978.

AUTHORS: YANG Zheng-shi [2799 2973 2514]
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ORG: Institute for Control of Drugs and Biological Products, Ministry
of Health, Beijing

TITLE: "Serological Typing of 3767 Local Strains of *E. coli*"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 187-197

TEXT OF ENGLISH ABSTRACT: In this report, the results of a serological analysis of more than 3000 local strains isolated from 15 regions between 1963 and 1973 were communicated. Except for a small number of strains isolated from animals, the vast majority was obtained from the feces of infants suffering from infantile diarrhea, and were found to be distributed over 82 O types and 43 H types. The following prevalent O types predominated: *E. coli* O₁₁₁ (45.66 percent), O₁₂₅ (9.51 percent), and O₁₁₄ (9.10 percent), and the following antigenic formulae were found to be most frequent. Among a total of 48.7 percent *E. coli* were O₁₁₁; K₅₈(B₄):H₋, O₁₁₁:K₅₈(B₄):H₂, and O₁₁₄:H₋.

On the other hand, from the excreta of piglets suffering from "dysentery," the following *E. coli* types were

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 187-197]

most frequently found: *E. coli* O₁₁₅ (9.73 percent), O₉ (7.96 percent), O₈ (7.08 percent), O₂₀ (7.08 percent), O₁₁₈ (6.19 percent), O₆₀ (5.13 percent), and O₁₀₁ (5.31 percent). Of the total, 20.4 percent, also possessed antigen A of possible epidemiological interest, 10.6 percent of the isolates were human pathogens, namely O₂₀, O₂₆ and O₁₁₉.

From the mucks excreta from baby rabbits suffering from infectious diarrhea, strains of *E. coli* O₄₉:H₋ were isolated.

Among 3767 *E. coli* strains, 1572 strains were found immotile, amounting to 41.73 percent. It was further found that among 2195 motile strains, 1793 contained 43 H antigens with the following predominating: H₂ (21.53 percent), H₆ (10.37 percent), H₃₄ (8.86 percent), H₂₇ (5.24 percent), H₁₈ (5.57 percent), followed by less frequent strains, namely H₁ (4.96 percent), H₁₀ (4.85 percent), H₁₁ (4.79 percent), and H₁₂ (4.79 percent). In all, these 9 types occupied 70.96 percent.

Finally, the details for serological typing were given and the pitfalls involved were briefly discussed.

Received 21 Apr 1978.

AUTHORS: None

ORG: Department of Microbiology, Zhongshan Medical College (Guangzhou),
The Chinese People's Liberation Army Unit No. 59175

TITLE: "The Virulence and Immunogenicity of Attenuated Strains of *R. Tsutsugamushi*"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 198-201

TEXT OF ENGLISH ABSTRACT: To obtain a poly-spectra antigenic attenuated strain is the prerequisite in the preparation of *R. tsutsugamushi* vaccine. The virulence of the attenuated strains, including "49," "Jesanlian" and "105" were lower than those strains generally isolated from patient's blood. In comparison with two other attenuated strains, we found that the virulence of "49" strain was the lowest. In mice experiment, the LD₅₀ was generally lower than 10^{-1.0}. The difference of LD₅₀ and ID₅₀ was 2.5-5.5 logs. The mice, vaccinated with "49" strain, after a lapse of about one month was challenged by other virulent strains (separately isolated from Guangdong, Fujian and Yunnan Province), the immunity index was more than 3.0 logs.

Received 26 Jan 1978.

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TITLE: "Preparation of Complement Fixation Antigens from *Rickettsia Tsutsugamushi*"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 202-207

TEXT OF ENGLISH ABSTRACT: Methods for preparing the complement-fixation antigens from tissue cultures were presented. Factors which influenced the titres of yolk sac membrane antigen were also investigated.

Large amount of antigen could be easily prepared from infected yolk sac without non-specific reaction. However, the sensitivity of yolk sac antigen for each strain of *R. tsutsugamushi* varied to some extent, and it was difficult to obtain good yield from all the adapted strains of *R. tsutsugamushi*. Since *R. tsutsugamushi* multiplied very well in the tissue cultures, we could usually obtain luxuriant growth even in the first passage. Because of the ease to

prepare antigen from tissue culture of any strain of *R. tsutsugumushi*, we considered it was of advantage in the preparation of antigens from several separate strains for cross-fixation tests as well as for clinical laboratory diagnosis of the disease.

Received 6 Feb 1978.

AUTHORS: HONG Tao [3163 3447]
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ORG: Institute of Virology, Chinese Academy of Medical Sciences, Beijing

TITLE: "Presence of Virus-Like Particles Suggestive of B Type in Specimens of Pharyngo-Esophageal Carcinoma of Chicken 1. An Electron Microscopic Study of 12 Diseased Chickens"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2,, Jun 79 pp 208-212

TEXT OF ENGLISH ABSTRACT: Some years ago, an unusual finding attracted our attention regarding the prevalence of pharyngo-esophageal carcinoma in the domestic fowl in Linhsien county, Honan, where a high incidence of esophageal cancer among humans was found.

Recently, electron microscopic examinations have been carried out on further study of this problem and results especially on the virus-like particles associated with the tumors are here presented.

Histologically, the majority of the tumors were classified as squamous cell carcinoma (96.6 percent), and only a few were of adenomas or adenoma-acanthomas.

The ultrastructural study confirmed the predominance of squamous epithelial cells, but in most tumors some fibroblast-like cells were also found intermingled with them.

The most prominent ultrastructural findings are the peculiar cytoplasmic inclusions and the B type virus-like particles, which possess the following characteristics:

1. The inclusions which we consider as site of virus multiplication are composed of many large particles of different size and morphology. They are arbitrarily designated as the loose form with round saw-toothed nucleoid and envelope (type I), the dense form devoid of envelope (type II), and the intermediate form less organized (type III). Besides the simultaneous presence of relatively mature B type virus-like particles in the inclusions which resemble the extracellular mature virus particles especially in respect to the eccentric nucleoid, the large particles with pleomorphic appearance are presumed to be the precursors of those extracellular mature B type-like particles.
2. The mature B type virus-like particles are roughly spherical or oval in shape and their size varies from 70 to 95 nm. The most significant feature is their eccentrically located nucleoid which is always heavily stained and often

shows an asteroid appearance. Sometimes an inner envelope and a space between the nucleoid and the inner envelope could be clearly seen.

3. Beside of the various particles described, there are numerous tiny vesicular granules inside the inclusions which look like the granules forming the large particles and thus are considered as original components or matrix of the agent. At the same time a few A type particles could also be observed among the matrix.

Owing to the fact that the virus leukemia is very prevalent in chicken, a lot of C type (leukemia virus) particles were anticipatively found in some of our specimens, but from their characteristic ultrastructures one could easily differentiate them from those of B type virus-like particles described.

From the above findings, (the B type virus-like particles are present in all 12 tumor specimens of the chickens examined and the peculiar inclusion with the virus-like particles) we have good reasons to assume that a new agent thus far recognized in the pharyngo-esophageal carcinoma of domestic chickens are not related either to leukemia virus or to other viruses.

[Continuation of WEISHENGWU XUEBAO No 2, Jun 79 pp 208-212]

LIU Fusheng [0491 1788 3932] of the Division of Pathology, Ritan Hospital, Chinese Academy of Sciences, provided the diseased chickens.

Received 25 Jul 1978.

AUTHOR: None

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The Chinese People's Liberation Army Unit No. 59171

TITLE: "Studies on Serotypes of *Pseudomonas Aeruginosa*"

SOURCE: Beijing WEUSHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
No 2, Jun 79 pp 213-217

TEXT OF ENGLISH ABSTRACT: 869 strains of *Pseudomonas aeruginosa* from more than 100 hospitals distributed in 16 provinces were collected. Serological typing of 98.7 percent of the collected strains were carried out. The first 4 types distributed most widely (about 59.0 percent), types 7,8 and 9 were next wide in distribution (31.3 percent), while types 4, 6, 10 and 11 had only very limited distribution. The I, II, IV, VI and VII among Fisher's 7 immunological type strains cross agglutinated with the serological types of our country. But there were no cross agglutination reaction for strains III and V. A more detailed description of the serological typing methods were given, and using the methods in epidemiological and ecological studies was discussed.

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